PIONEER

Service Manual

CIRCUIT & MECHANISM DESCRIPTIONS REPAIR & ADJUSTMENTS

ORDER NO. ARP-256-0

STEREO TURNTABLE

PL-707

MODEL PL-707 COMES IN FOUR VERSIONS DISTINGUISHED AS FOLLOWS:

Type	Voltage	Remark
KUT	AC120V only	U. S. A. model (Without cartridge)
HE	AC220V, 240V (switchable)	European continent model
HB	AC220V, 240V (switchable)	United Kingdom model
S	AC110V, 120V, 220V, 240V (switchable)	General export model

- **This service manual is applicable to the KUT type. For servicing of the other types, please refer to page 56.**
- **Ce manuel d'instruction se refère au mode de réglage, en francais.**
- **Este manual de servicio traat del método de ajuste escrito en español.**

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1. SPECIFICATIONS

Motor and Turntable

Drive System ..... Direct-drive
Motor ..... Quartz PLL Hall motor
Turntable Platter ..... 310 mm diam. aluminum alloy die-cast
Speeds ..... 33-1/3 and 45 rpm
Wow and Flutter ..... Less than *0.012% (WRMS)
0.025% (WRMS)
± 0.035% WTD Peak (DIN)
Values marked with an "*" designate the wow and flutter for motor, and do not include the cartridge or tonearm load.
Signal-to-Noise-Ratio ..... More than 80 dB (DIN-B)
(with Pioneer cartridge model PC-6MC)

Tonearm

Type ..... Static-balance type, Straight pipe arm
Effective Arm Length ..... 235 mm
Overhang ..... 15 mm
Usable Cartridge Weight ..... 3 g (min.) to 8 g (max.)

PC-6MC Specifications

Type ..... Moving coil type
Stylus ..... 0.3 x 0.7 mil diamond (PN-6 MC)
Output Voltage ..... 2.2 mV
(1 kHz, 5 cm/s LAT. Peak)
Tracking Force ..... 1.7 g to 2.3 g (proper 2 g)
Frequency Response ..... 10 to 35,000 Hz
Recommended Load ..... 50 kΩ
Weight ..... 3.3 g

Subfunctions

Auto lead in, Auto return, Auto cut, Repeat, Quick play, Quick stop, Anti-skating, Arm elevation, Tracking-force direct-read-out, Tonearm height adjusting device (± 3 mm), Insulator height adjusting device, Free stop hinges.

Miscellaneous

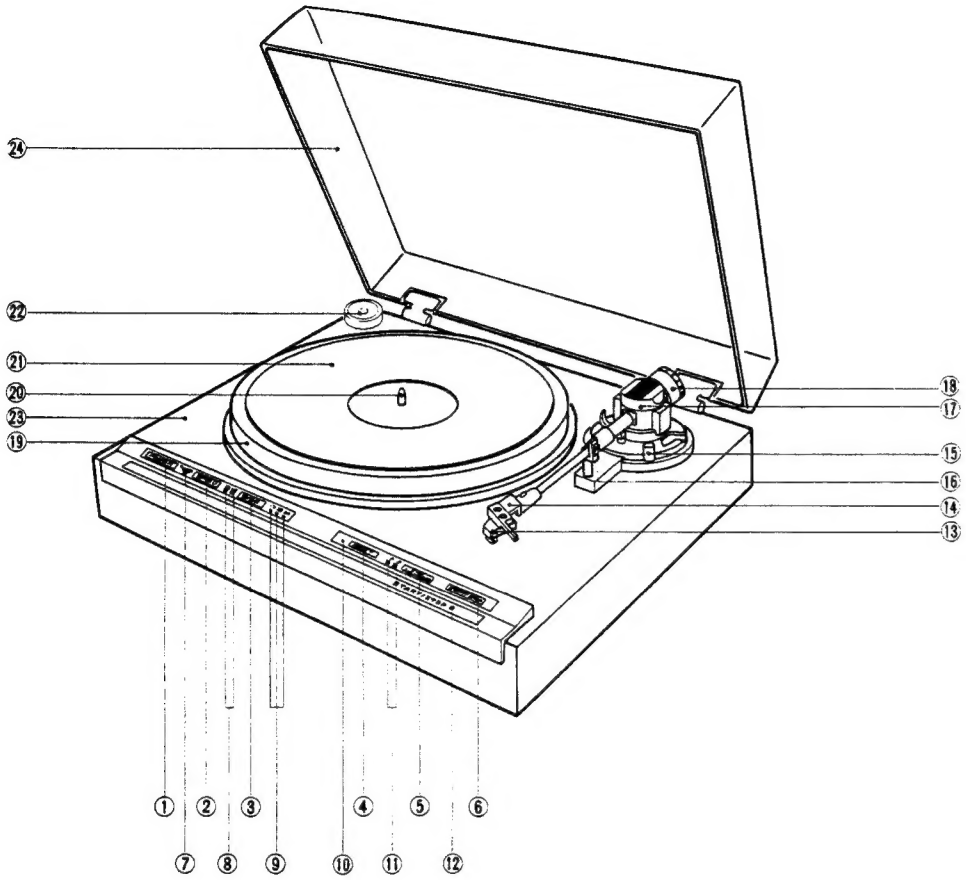
Power Requirements
HE, HB, HP models ..... AC 220 V/240 V
(switchable), 50, 60 Hz
KUT, KCT models ..... AC 120 V, 60 Hz
S, S/G models ..... AC 110 V/120 V/220 V/240 V
(switchable), 50, 60 Hz
Power Consumption
HE, HB, HP models 9W
KUT, KCT models 10W
S, S/G models 7W
Dimensions ..... 460 (W) x 164 (H) x 409 (D) mm
18-1/8 (W) x 6-1/2 (H) x 16-1/8 (D) in.
Weight ..... 8.1 kg/17 lb 14 oz

Accessories

EP Adapter 1
Operating Instructions 1
Catridge mounting parts (For KUT and KCT models)
Screws (L) 2
Screws (M) 2
Screws (S) 2
Washers 2
Nuts 2

NOTE:
Specifications and design subject to possible modification without notice, due to improvements.

2. FRONT PANEL FACILITIES



① POWER SWITCH

Press this switch to turn the power on and off.
[ON] (depressed position) : Power is switched ON.
[OFF] (released position) : Power is switched OFF.
When the POWER switch is set to ON, the following switches are set automatically.

- SPEED switch — [33]
- RECORD SIZE switch — [30]
- REPEAT switch — [OFF]

② SPEED SWITCH

Set this switch in accordance with the speed of the record which is to be played.
[33] indicator lights:
For playing 33-1/3 rpm records.
[45] indicator lights:
For playing 45 rpm records.

③ RECORD SIZE SWITCH

Set this switch in accordance with the size of the record which is to be played.
[12"30] indicator lights:
For playing 30 cm (12") records.
[10"25] indicator lights:
For playing 25 cm (10") records.
[7"17] indicator lights:
For playing 17 cm (7") records.

④ REPEAT SWITCH

Press this switch so that the indicator lights for repeat play.

⑤ ARM ELEVATION SWITCH

- Use the switch to manual play.
- Use the switch to suspend record play temporarily.
- Use the switch when changing the tracks during manual play.

[▼] indicator lights:
The tonearm rises (the stylus moves away from the record).
[▼] indicator lights:
The tonearm descends (the stylus is lowered onto the record).

⑥ START/STOP SWITCH

Press this switch when starting auto play or when stopping play

⑦ QUARTZ LOCK INDICATOR

This lights when the platter is rotating at exactly 33-1/3 or 45 revolutions per minute.

⑧ SPEED INDICATORS (33, 45)

These indicate the platter speed.
[33] lights:
Platter is rotating at 33-1/3 rpm.
[45] lights:
Platter is rotating at 45 rpm.

⑨ SIZE INDICATORS (30, 25, 17)

These indicate the record size.
[12"30] lights – 30 cm (12")
[10"25] lights – 25 cm (10")
[7"17] lights – 17 cm (7")

⑩ REPEAT INDICATOR (REPEAT)

This indicator lights up when the repeat play function is utilized.

⑪ ARM ELEVATION INDICATOR (▼ · ▼)

These indicators indicate whether the tonearm is the raised (up) or lowered (down) position.
[▼] lights:
The tonearm rises (the stylus moves away from the record).
[▼] lights:
The tonearm descends (the stylus is lowered onto the record).

⑫ START/STOP INDICATOR

- This lights when the START/STOP switch has been pressed and auto play has been started.
- This lights when the START/STOP switch is pressed to suspend play.

⑬ CARTRIDGE (PC-6MC)

NOTE:
A cartridge is not provided with the KUT and KCT models and so your own cartridge should be mounted, following the instructions laid down in CARTRIDGE MOUNTING.

⑭ HEADSHELL

⑮ ANTI-SKATE CONTROL

This is rotated when performing the anti-skating adjustment.

⑯ ARM REST

This serves to hold and clamp the tonearm. When moving the tonearm, release the clamp.

⑰ TONEARM

⑱ TRACKING FORCE ADJUSTMENT WEIGHT

This is used when adjusting the tracking force.

⑲ PLATTER

⑳ PLATTER SHAFT

㉑ RUBBER MAT

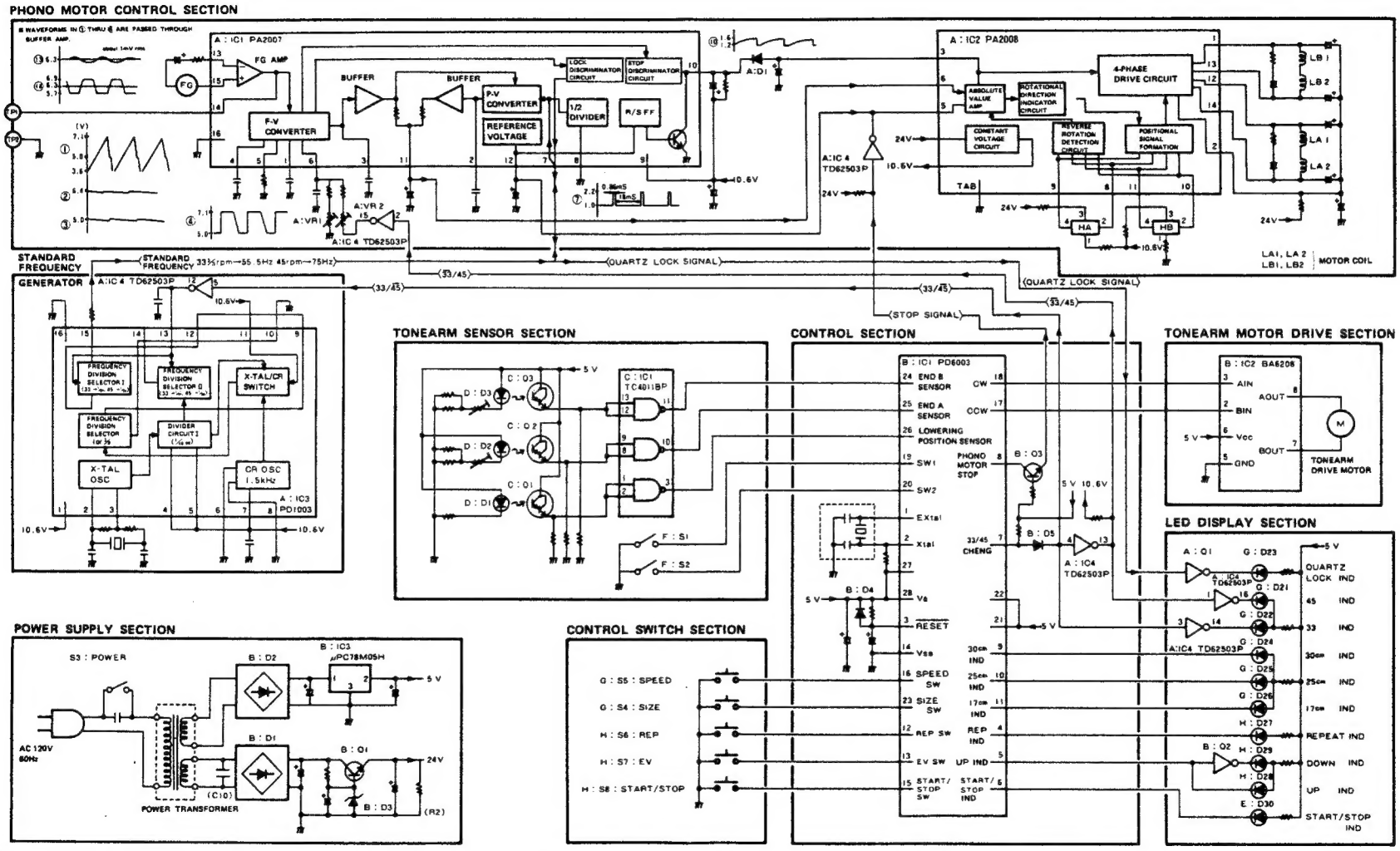
㉒ EP ADAPTER

This is used when playing records without a "middle."

㉓ CABINET

㉔ DUST COVER

3. BLOCK DIAGRAM



SWITCH

S1 : MICRO	ON : OFF	S7 : ARM ELEVATION	UP—DOWN
S2 : MICRO	ON : OFF	S8 : START/STOP	ON—OFF
S3 : POWER	ON : OFF		
S4 : SIZE	30cm 25cm 17cm		
S5 : SPEED	33⅓rpm 45rpm		
S6 : REPEAT	ON : OFF		

The underlined indicates the switch position.

NOTE:
The letters preceding the circuit component symbols denote the unit where the component is located.

A: MOTOR ASS'Y (PXM-125)
B: CONTROL UNIT (XWM-141)
C: PHOTO-TRANSISTOR UNIT (XWX-137)
D: LED UNIT (XWX-138)
E: START UNIT (XWX-136)
F: DRIVER (F) ASS'Y
G: CONTROL (A) UNIT (XWX-134)
H: CONTROL (B) UNIT (XWX-135)

4. MECHANISM DESCRIPTION

To facilitate understanding the operation of the PL-9, the total unit may be broken down into blocks consisting of the tonearm drive mechanism, the sensing mechanism serving to sense lead in and lead out positions of the tonearm, the control section consisting of the full-auto control IC PD6003, and the motor section functioning to drive the turntable platter.

The operational and functional relationship between each block is quite complex, so in order to understand total system operation, it is first necessary to thoroughly understand the operation and function of each block, then carefully study their interrelationships.

This manual covers the subject in that order. First, the operation and function of each block will be described, then a timing chart is presented to clarify block relationships.

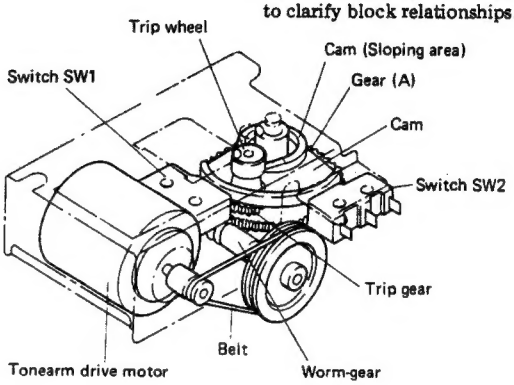


Fig. 4-1 Tonearm drive mechanism

4.1 TONEARM DRIVE MECHANISM

1. The tonearm drive mechanism consists of the tonearm drive motor, worm-gear, gear (A), gear (B), trip gear, trip wheel, cam, switch SW1, and switch SW2. (Fig. 4-1)
2. The gear cluster is shown in Fig. 4-2. When the cam is held immoveable and gear (A) is rotated in a counterclockwise direction, a small amount of friction is felt, but gear (B) and trip gear also rotate. Note that rotation of the trip gear also rotates the trip wheel. (Fig. 4-3) Also note that when the cam is free to rotate, friction will cause it to rotate in the same direction as gear (A) and (B).
3. Refer to Fig. 4-4. The elevation shaft contacts the sloping area located around the center shaft of the cam. Also note the position of the cam at this time. This is the position the mechanism will be in prior to starting up the unit. The tonearm will be on the arm rest, and arm-elevation will be in the DOWN position.

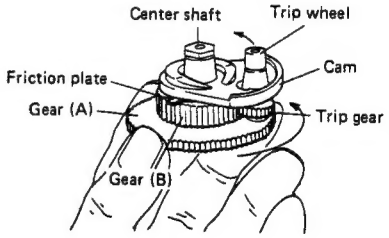


Fig. 4-2 Gear cluster

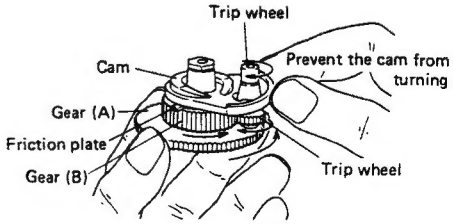


Fig. 4-3 Gear cluster operation

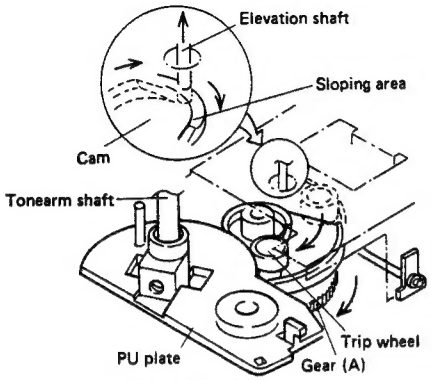


Fig. 4-4 Lead in operation

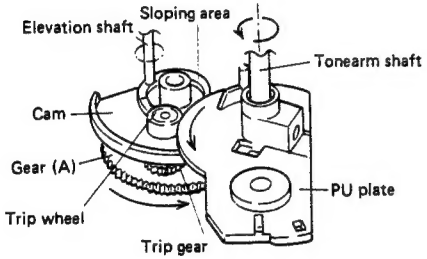


Fig. 4-5 Return operation

4. Turn the worm gear by hand imitating what would occur if the START/STOP button were depressed causing the motor to rotate the gear. Worm gear rotation causes gear (A) to rotate, and the gears shown in Fig. 4-2 and 4-3 of item 2 above all turn in a clockwise direction.
5. The elevation shaft raises as the gear/cam assembly rotates, and this in turn causes the tonearm to raise. The two switches, SW2 and SW1 are also turned OFF.
6. As the assembly rotates further, the trip wheel and PU plate attached to the tonearm shaft come into contact, creating the same condition as occurred in item 2 where the cam was held in an immoveable position. Continued rotation of the trip wheel causes the PU plate attached to the tonearm shaft to turn.
7. Rotation of the PU plate moves the tonearm to the point specified by the sensing and control mechanisms (covered in the following paragraphs). When the tonearm reaches that specified point, the motor reverses itself, and the cam switches SW1 and SW2 ON in sequence. Arm-elevation goes to the DOWN position and playback starts.
8. In practice, each of the above operational steps are controlled either directly or indirectly from the control section or by the forward or reverse rotation of the motor. The control section picks up its operational cues by detecting the ON or OFF status of switch SW1 and SW2, and these switches are controlled by the movement of the mechanism positioning the cam.

4.2 SENSING MECHANISM

As shown in Fig. 4-6, the shutter fixed to the tonearm is positioned to travel in the space between the phototransistors and LEDs mounted on their respective boards. The shutter has three 0.7mm slits cut out of its outer circumference at the position the outer edge of a 30cm, 25cm, or 17cm record disc would be located. The slit, or opening located inside of those three slits is the end sensor slit (Fig. 4-7).

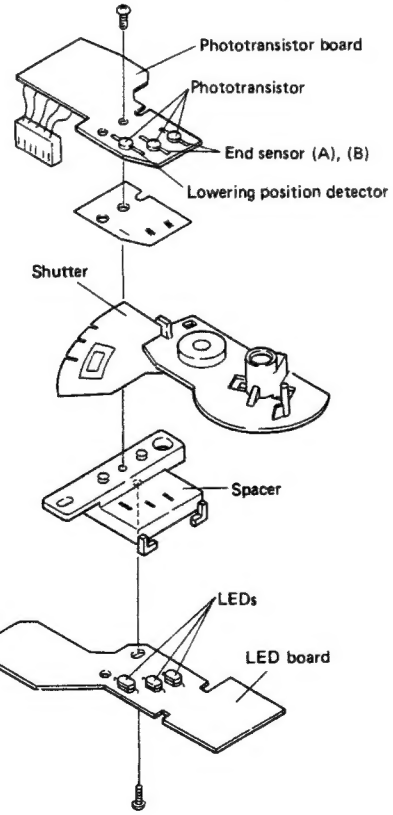


Fig. 4-6 Sensing mechanism

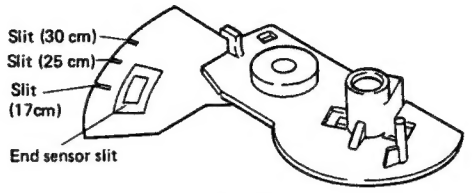


Fig 4-7 Shutter

■ Lowering Position Detector

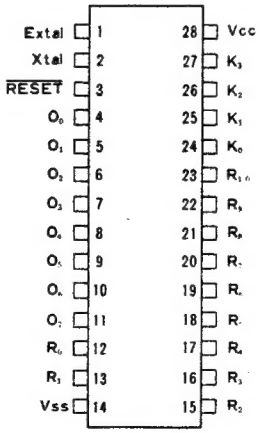
1. This unit is mechanically designed to allow the shutter to pass between two boards mounting the sensing elements or photocoupler. The photocoupler consists of an LED and phototransistor.
2. The shutter moves with the tonearm, and a signal is transmitted to the control section by the light emitted from the LED (normally interrupted by the opaque portion of the shutter) being passed through the 30cm, 25cm, or 17cm slit and triggering the phototransistor ON.

■ End Sensor

1. As the tonearm travels toward the inside of the record disc and reaches the end sensor zone (end sensor slit), the light transmitted by the LED is passed through the end sensor slit and turns the phototransistor ON, then OFF. This causes the pulse signal transmitted by end sensor A and B to go 90° out of phase.
2. The pulse frequency is compared with the rotational speed (movement) of the tonearm, and then sent to the control section as the record disc lead-out groove sensor signal.

■ Arm Rest Position Sensor

1. When the three sensors consisting of the lowering position sensor and end sensor (A) and (B) are all simultaneously picking up transmitted light, control determines that the tonearm is at the arm rest position.
2. This status is used to control starting and stopping of the turntable motor during manual operations, or, in the auto-return mode, simply perceives that the tonearm has returned to the arm rest.



IC PD6003 pins

Pin	Function	Timing	Pin	Function	Timing
O_0	Repeat display output		R_5	CW rotation output	
O_1	EV-UP display output		R_6	SW1 input	—
O_2	START-STOP display output		R_7	SW2 input	—
O_3	Speed selector output	H: 33 L: 45	R_8		
O_4	Turntable motor stop output	H: STOP L: START	R_9		
O_5	30cm display output		R_{10}	Size selector switch input	
O_6	25cm display output				
O_7	17cm display output		K_0	End sensor B input	—
			K_1	End sensor A input	—
R_0	Repeat switch input		K_2	Lowering position sensor input	
R_1	EV switch input		K_3		
R_2	START-STOP switch input				
R_3	Speed selector switch input				
R_4	CCW rotation output				

PD6003 Pin Function Table

Fig. 4-8 PD6003

4.3 CONTROL SECTION

The functions of the full-auto control IC PD6003 are described in this section. The table shown in Fig. 4-8 lists the function performed by each pin of PD6003. Please refer to this table as the detailed explanation progresses.

1. When the tonearm is at the arm rest position, pressing the START/STOP button causes the turntable motor to start rotating and illuminates the LED built into the START/STOP button and the EV UP display LED. At the same time the tonearm drive motor moves the tonearm toward the lead in groove of the record.
2. The tonearm drive motor continues rotating until it reaches the point where the signal from the lowering position sensor is picked up. When that point is reached, the drive motor is reversed, lowering the tonearm.
3. End sensor A and B is used to detect the end of playback, but if the START/STOP button is depressed during playback, the tonearm drive motor starts rotating in the return direction and tonearm return operation is started. When the tonearm reaches the point directly above the arm rest, the tonearm drive motor starts rotating in the reverse direction and lowers the tonearm on the arm rest.
4. If the operation in the above step is carried out with the repeat switch ON, the tonearm again will return to the lead in groove. If the repeat switch is OFF, the turntable motor will stop at this point.

4.4 ACTUAL OPERATION (PLAYBACK OF A 33 rpm, 17cm RECORD DISC)

- **Automatic Lead in**

1. Depress the button and turn the power switch ON. Set the speed for the record to be played (33 rpm). When the 33 rpm button is depressed, an instruction signal from the motor assembly will illuminate the 33 rpm display LED, D22. Next, set the proper size for the record to be played (17cm in this case). When the size selector switch is depressed twice, the 11 pin of PD6003 will go to a low level, and the 17cm display LED, D26 will be illuminated.
2. With the turntable thus set up, depressing the START/STOP button causes the 15 pin of PD6003 to go to a low level. Also 6 pin goes to a low level, illuminating the START/STOP display LED, D30. At the same time, pin 17 goes to a low level and pin 18 goes high, starting rotation of the tonearm drive motor in the mechanism section.
3. The worm gear is coupled to the rotating motor by belt, and the worm gear turns gear (A) (and cam) in a clockwise direction. The tonearm is lifted by the arm-elevation mechanism, and switch SW2 and SW1 go OFF.
4. Gear (A) (and the cam) continue rotating until finally, the cam makes contact with the PU plate fixed to the tonearm shaft. When the cam contacts the PU plate, it stops rotating. However, the trip wheel continues rotation along with gear (B).

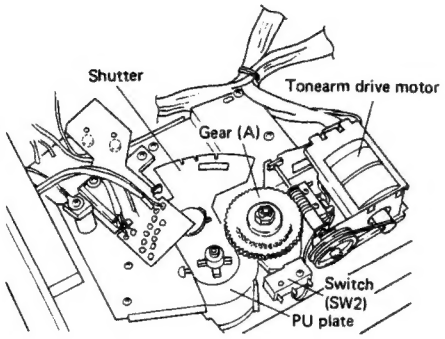


Fig. 4-9 Mechanism section

5. The trip wheel is making contact with the arm rotation stopper, and the rotating trip wheel causes the PU plate to turn. The turning PU plate moves the tonearm toward the center of the platter.
6. As the tonearm moves, so does the shutter attached to the tonearm shaft. The tonearm (and shutter) go past the 30cm and 25cm lowering position until it reaches the 17cm record disc lead-in groove where the third pulse signal from the lowering position sensor (light from LED passes through the slit in the shutter fixed to tonearm shaft turning phototransistor ON) causes the 26 pin of PD6003 to go to a low level. (Pulse signals are also produced at 30cm and 25cm positions.)
7. This causes the PD6003 17 pin to go low, and the 18 pin to go to a high level, and after the tonearm drive motor stops, it commences reverse rotation. As it rotates, the arm-elevation shaft riding on the sloping area of the cam moves down off the slope and playback starts.
8. When the tonearm drive motor rotating in reverse (switch SW1 ON) turns switch SW2 ON, the PD6003 6 pin goes to a high level, extinguishing the START/STOP display LED, D30. The turntable will not go into the auto-stop until the START/STOP display LED is extinguished even though the START/STOP button is depressed. Also, when both the tonearm dirve motor and switch SW2 are ON, PD6003 17 and 18 pin both go high, stopping the drive motor.
9. If the tonearm does not move off the arm rest within 8 seconds after the START/STOP button is depressed (tonearm clamped in arm rest), the START/STOP display indicator starts flashing. If this status (flashing) continues for another 11 seconds, the start instruction is cancelled and the tonearm lowers in the arm rest.
10. The elevation -up display LED, D28 illuminates when the START/STOP button is depressed, and when the tonearm moves to the record disc and lowers down, D14 is extinguished. PD6003 senses the first pulse as the 30cm position, the second as the 25cm, and the third as the 17cm record size position. When it determines that the tonearm has reached the proper lowering position, pin 5 goes to a high level, extinguishing the display.

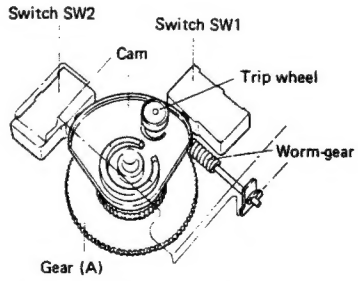


Fig. 4-10 Switch SW1, 2 position

- **Arm-elevation UP and DOWN**

1. When the arm-elevation switch is depressed during record playback, arm-elevation goes UP and playback is temporarily stopped.
2. When the arm-elevation switch is depressed, the 13 pin of PD6003 goes to a low level. Pin 5 also goes low, and illuminating the elevation display LED, D28.
3. At the same time, pin 17 goes to a low level and pin 18 goes high, starting tonearm drive motor rotation. This causes the cam to turn, and the elevation shaft to ride up on the sloping section of the cam. This action causes the arm-elevation to go to the UP position, stopping record playback.
4. The tonearm drive motor continues to move the cam until the position is reached where SW1 is turned OFF (tonearm still in UP position).
5. To restart playback, the arm-elevation switch is depressed again. This causes the 13 pin of PD6003 to go to a low level. The 5 pin goes high, extinguishing the elevation display LED, D14.
6. At the same time, pin 17 goes high and pin 18 goes low, causing the tonearm drive motor to rotate in an opposite direction of that in the UP position. As the cam turns, the elevation shaft drops down off the slope, lowering the tonearm and starting playback again.
7. The tonearm drive motor continues to move the cam until the position is reached where SW2 is turned ON (tonearm still in DOWN position).

For manual playback operation, depress the arm-elevation switch to raise the tonearm up off the arm rest (UP), then move it to the desired point over the record by hand. Depressing the arm-elevation switch again will then lower (DOWN) the tonearm onto the record. Operationally, this follows the sequence listed in items 2 through 7 above.

Also during manual play, when the tonearm is manually moved toward the center of the record (off the arm rest), the platter commences rotation. When the tonearm is moved off the arm rest, PD6003 26 pin (signal pin from lowering position sensor) goes to a high level, and the 8 pin goes to a low level, starting the motor rotation.

■ Auto-return

1. When record playback is over, the tonearm stylus goes from the band of audio grooves into the lead out groove, and the pulse width of the signal output from end sensor A and B become more narrow. This informs PD6003 that record playback has ended.

> The phase of the pulse from end sensor A and B is set so that B leads A by 90°, however this phase offset is not used for detection of the end of playback, but to prevent any unintentional operations from sources such as record disc eccentricity.

2. When playback completion is detected, PD6003 pin 17 goes to a high level and pin 18 goes low, starting the tonearm drive motor rotating. As rotation moves the cam, the slope causes the arm-elevation to go UP, raising the tonearm.
3. As the cam continues rotating, it strikes the PU plate. This stops cam movement, but the trip wheel continues rotating and turns the PU plate. This results in the tonearm being returned to a position above the arm rest.
4. At this position, light strikes the lowering position detector and end sensor A and B (all three at once), and pin 24, 25, and 26 of PD6003 go to a low level.
5. One to two seconds later, PD6003 pin 17 goes low and pin 18 goes high, and after the tonearm drive motor stops, it reverses rotation and sends the arm-elevation back down the cam slope. This lowers the tonearm on the arm rest ending playback.
6. At the same time, the cam turns switch SW1 ON (switch SW2 is already ON). When both switches come ON, both pin 17 and 18 (PD6003) go to a high level, stopping the tonearm drive motor. Also, when the tonearm reaches the arm rest position, pin 8 goes high, lowering the tonearm and causing pin 5 to go high. This causes the platter to stop rotating and extinguishes the elevation-up display LED, D28.

■ Auto-stop

1. When it is desired to stop record playback in the middle of the record, depress the START/STOP button. As the START/STOP button is depressed, PD6003 pin 15 goes to a low level. Pin 17 goes high and pin 18 goes low, starting rotation of the tonearm drive motor. Rotation causes the arm-elevation to ride up on the slope of the turning cam raising the tonearm.
2. Also 6 pin goes to a low level, thereby illuminating the START/STOP display LED, D30. From here the operation is the same as that for auto-return (above), items 3 through 6.
3. The START/STOP display LED, D30 are extinguished by the tonearm drive motor reversing rotation and turning switch SW1 ON and sending PD6003 pin 6 to a high level.

■ Auto-repeat

1. To repeat playback of the same record, depress the repeat button. This causes PD6003 pin 12 to go to a low level. At the same time, pin 4 also goes low, illuminating the repeat display LED, D27.
2. When the repeat button has been depressed, after autoreturn operations have returned and lowered the tonearm on the arm rest, the unit again goes into autolead in operations and continues playback. (The platter motor continues to rotate.)

5. CIRCUIT DESCRIPTIONS

5.1 SIMPLE SIGNAL PATH

The PL-707 motor drive circuit consists of the control IC PA2007, reference phase generator IC PD1003, motor drive IC PA2008, and IC TD62504P functioning to produce the various operational switch signals.

The signal picked up from the speed sensor section is amplified by the FG amp, then converted to the speed sensor signal voltage (DC) by the F/V converter.

Reference phase voltage is obtained by extracting the reference phase from PD1003 pin 15, passing it through the 1/2 divider, then sending it through the P/V converter to be used as reference phase voltage (DC).

The speed sensor signal voltage and reference phase voltage are each passed through a buffer amp and resistance and combined (compared). The resulting voltage is taken from the IC PA2008 pin 6 and input into the absolute value amp, and is used to control the 4-phase drive circuit motor rotation voltage, maintaining the motor at a fixed speed.

5.2 SPEED SENSOR SECTION

1. The speed sensor board consists of a single printed circuit.
2. Above this, rotates a rotor with 400 magnetized poles on its lower face. Output varies in accordance with the rotational speed of the rotor.
3. The output (frequency) from the speed sensor board is 111Hz for 33 1/3 rpm and 150Hz for 45 rpm.
4. The output signal is sent to PA2007 as a balanced input.

5.3 FG AMP

In order to square the waveform of the signal obtained from the speed sensor section (output: 0.5 — 2.0 mV rms) prior to inputting it into the F/V converter, it is amplified 69dB across a band width of 20 to 160Hz.

5.4 F/V CONVERTER

1. Since the rotational speed is detected at a fixed frequency, the frequency must be converted to a voltage (DC). This function is performed by the F/V converter.
2. Previously (in PA2004) this was done by a 2-frequency F/V converter, however, increasing control gain of PA2007 allows a signal-frequency F/V to be used.
3. F/V converter gain does not change even with rpm changes.
4. Switching reference frequency is shown in Fig. 5-1.
   When the switch is OFF, speed is set to 33 1/3 rpm, and when the switch is ON, the variable resistor used by 33 1/3 rpm is connected parallel to the 45 rpm variable resistor. The resulting total impedance establishes rotational speed. Thus, each time 33 1/3 rpm is adjusted, 45 rpm must also be adjusted. This arrangement prevents any rotational instability that might result from both switches being temporarily OFF when speed changes are made by switching from 33 1/3 — 45 rpm.
5. Co, Ct, Rt, and Rfv are each connected to ground, but the grounding point is very close to that of PA2007. Also, Rt is a 0.01 μF ceramic capacitor for noise and oscillation removal, and it is grounded in close proximity to PA2007 too.

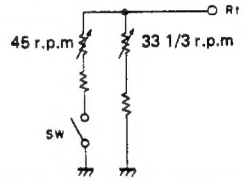


Fig. 5-1 Switching reference frequency

5.5 REFERENCE PHASE GENERATOR IC PD1003

1. When power is turned ON, the X'tal oscillator block generates a 6.144 MHz signal by using the externally connected crystal oscillator.
2. This is reduced to 6kHz by divider circuit 1 (1/1024), then this divided signal is input to divider circuit 2.
3. The 6kHz signal input to divider circuit 2 is further divided 1/27 for 33 1/3 rpm operation, and 1/20 for 45 rpm, then transmitted from pin 15 to PA2007 pin 8.
   33 1/3 rpm: 222.2Hz
   45 rpm: 300Hz

5.6 1/2 DIVIDER AND P/V CONVERTER

The signal received at the 8 pin (item above) is further divided by 1/2 by the 1/2 divider, then input to the P/V converter. The P/V converter serves to convert the reference phase taken from the 1/2 divider to DC voltage.

The reference phase converted into DC voltage is combined (by the buffer amp and resistor) with the DC voltage from the F/V converter (and used for rotation speed) and transmitted from pin 11 as a motor rotation speed control signal to IC PA2008 pin 6, then finally to the absolute value amp (Fig. 5-2).

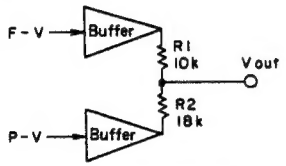


Fig. 5-2 (F–V) + (P–V) circuit

5.7 PHASE-LOCK DISCRIMINATOR CIRCUIT

When phase control is in effect, the output characteristics of the F/V converter appear as in Fig. 5-3. The portion that shows no change in speed when load torque is varied up and down can be considered as the phase-locked area, and the portion where large rotational speed changes occur (as in Fig. 5-4) is outside the phase-locked area. Thus, F/V converter output can be input into an absolute value comparator having an upper and lower threshold. A theoretical diagram of such a circuit is shown in Fig. 5-5.

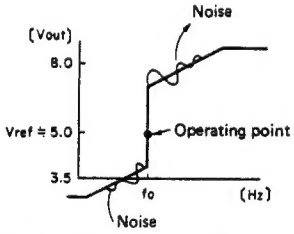


Fig. 5-3 Input/output characteristics

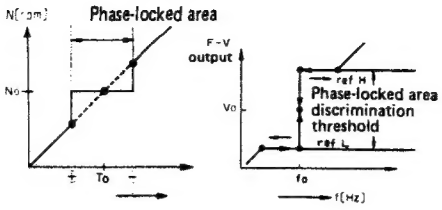


Fig. 5-4 F/V converter output

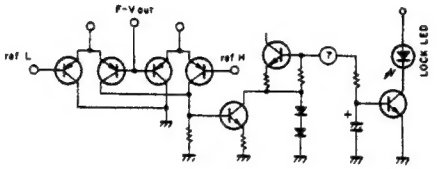


Fig. 5-5 Phase-locked discrimination theoretical circuit

5.8 STOP DISCRIMINATOR CIRCUIT

1. Depressing the START/STOP button of the PL-707 transmits a stop signal generating a reverse torque and applying a brake to the motor. Motor rotation stops almost immediately.
2. The stop discriminator circuit functions to detect low or high rotation speed through the charge/discharge status of capacitors and resistors connected to IC PA2007 pin 10 (To/STOP), and when rotation drops below a certain speed, motor torque is dropped to zero. A theoretical circuit diagram is shown in Fig. 5-6.
3. After that, the platter turns a small amount due to inertia, then stops.

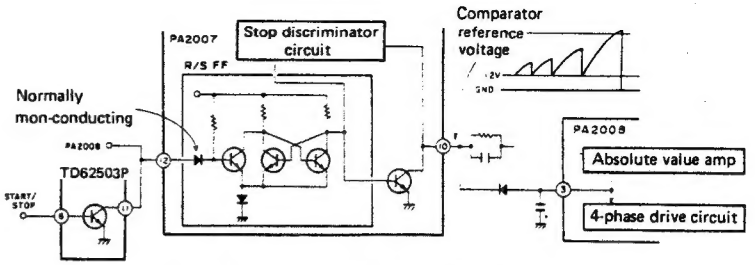


Fig. 5-6 Stop discriminator theoretical circuit

5.9 ABSOLUTE VALUE AMP AND ROTATION DIRECTION INDICATOR CIRCUIT

1. The signal at the 6 pin (control input) is compared with the signal at the 5 pin (reference voltage) and the difference in voltage is used to generate current in the motor winding. The input/output characteristics are shown in Fig. 5-7.
2. The control input is higher than the reference voltage (Vref 5V) when the rotation of the platter is higher than specified speed. When this occurs, the absolute value amp sends an indication (instruction) to the rotation direction indicator circuit to generate reverse torque in order to drop the speed of the motor.
3. The control input is lower than the reference voltage (Vref 5V) when the rotation of the platter is lower than specified speed. When this occurs, the absolute value amp sends an indication (instruction) to the rotation direction indicator circuit to generate forward torque in order to increase the speed of the motor.

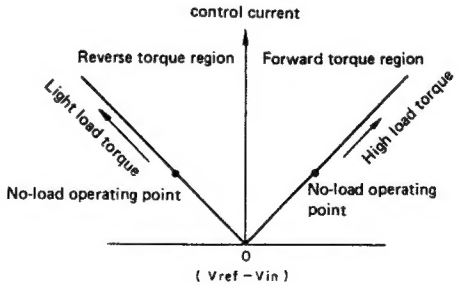


Fig. 5-7 Input/output characteristics

5.10 DRIVE CIRCUIT

1. The HA and HB Hall elements (6 magnetized pole pieces fixed to the circumference of the motor) are attached electrically 90° out of phase with each other. These elements are used to sense the rotational position of the motor.
2. The position sensing signal produced by the Hall elements are each output to the block diagram position signal synthesizing circuit, and their waveforms are shaped as shown in Fig. 5-8.
3. The staircase waves are each input into the block diagram 4-phase drive circuit, and as shown in Fig. 5-8, LA and LB alternate back and forth in a 90° duty cycle (voltage) to turn the motor.
4. LA and LB amplitude is in proportion to the output of the absolute value amp.

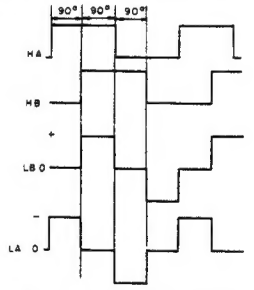


Fig. 5-8 Drive circuit waveforms

5.11 REVERSE ROTATION SENSING CIRCUIT

1. The motor used in the PL-9 is the dual-direction drive circuit type, and if manually forced in the reverse direction, it will continue to apply a forward torque in an attempt to restore forward rotation as long as it does not exceed specified rotation speed.
2. However, when reverse rotation exceeds 45 or 33 1/3 rpm, the rotation direction indicator circuit detects this as an overrun in the forward direction and applies reverse torque in an attempt to bring it to specified rotation speed.
3. Reverse torque applied to the platter already rotating in reverse will further increase the speed and the turntable will run out of control.
4. The reverse rotation guard circuit prevents the platter from running out of control.
5. The equivalent circuit of the reverse rotation sensing circuit consists of a D type flip-flop (D input output at Q by CK triggering).

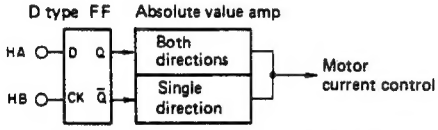


Fig. 5-9 Reverse rotation sensor equivalent circuit

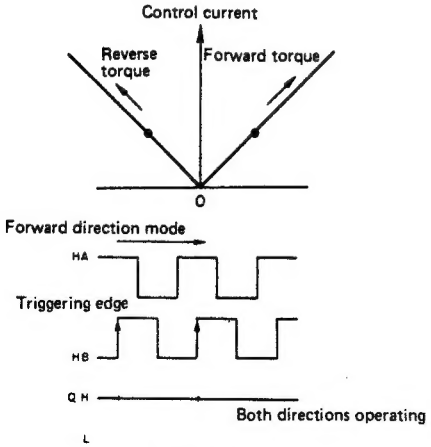


Fig. 5-10 Forward direction mode

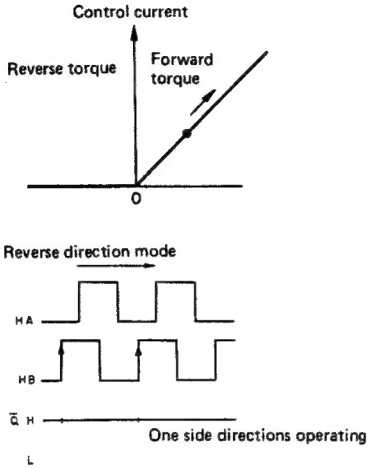
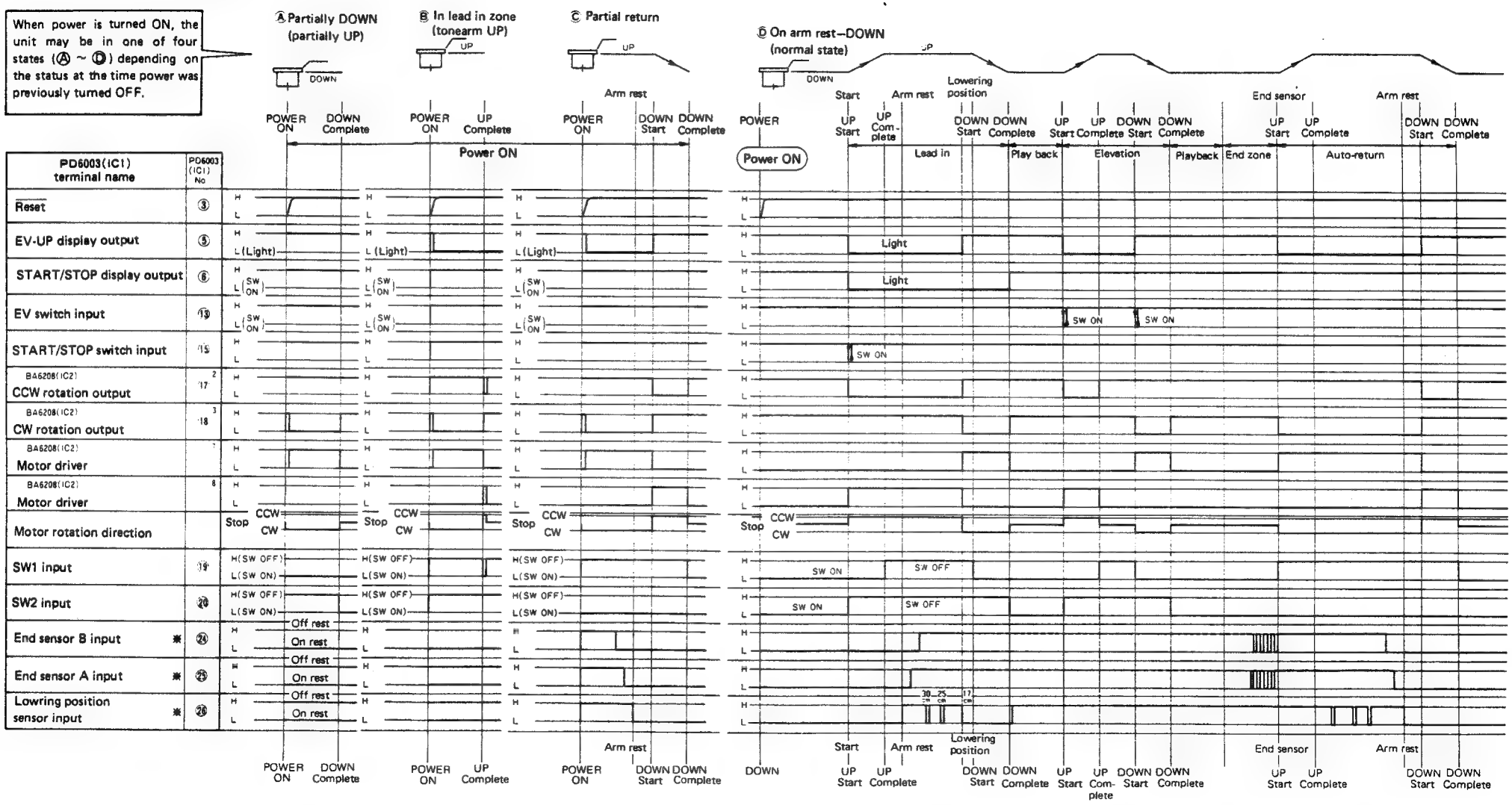


Fig. 5-11 Reverse direction mode

■ TIMING CHART 1

Operational sequence for a single cycle between power ON and automatic stop (full-automatic operation, 17cm record disc).

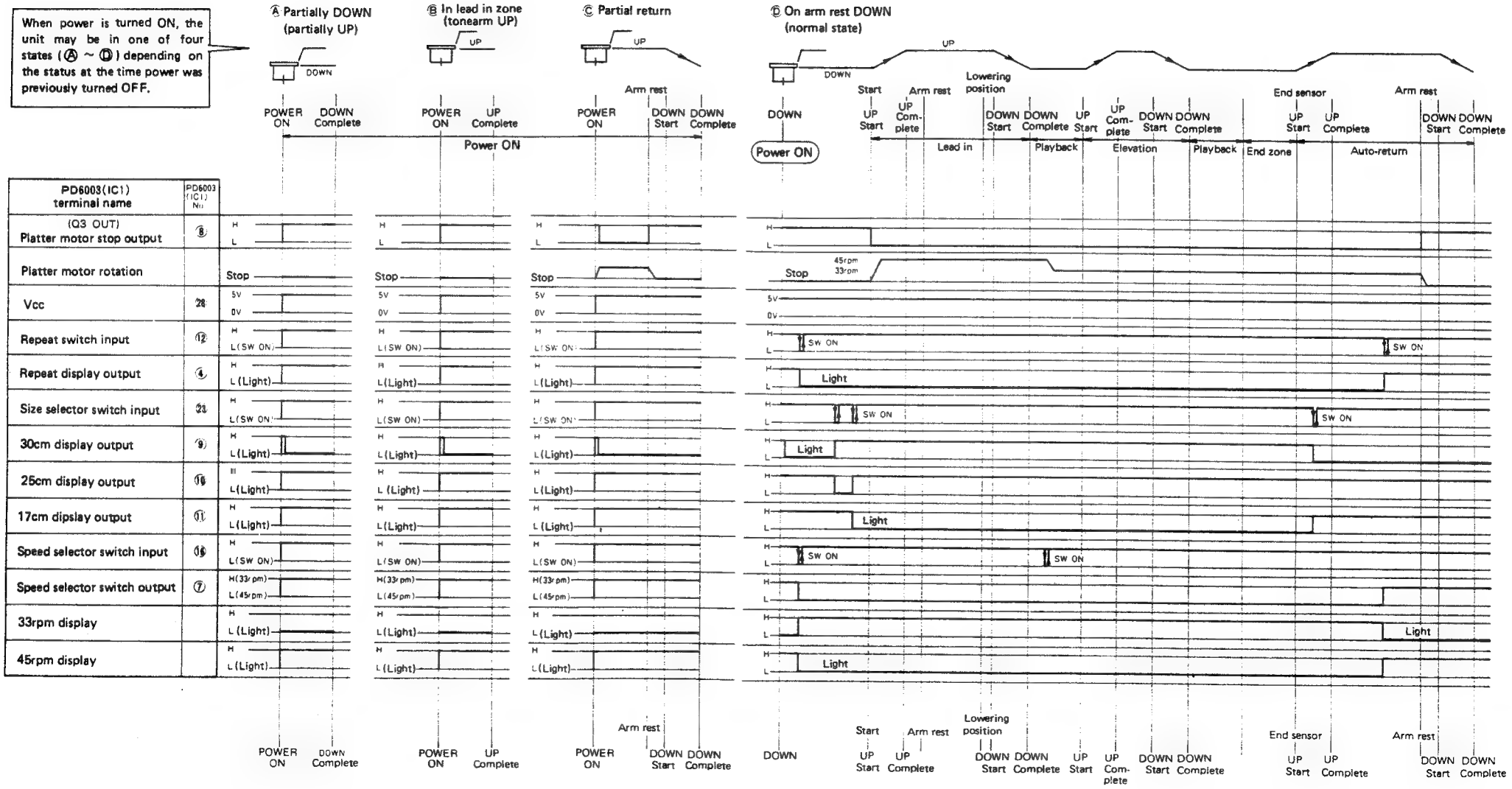
When power is turned ON, the unit may be in one of four states (Ⓐ ~ Ⓓ) depending on the status at the time power was previously turned OFF.



■ TIMING CHART 2

Operational sequence for a single cycle between power ON and automatic stop (full-automatic operation, 17cm record disc).

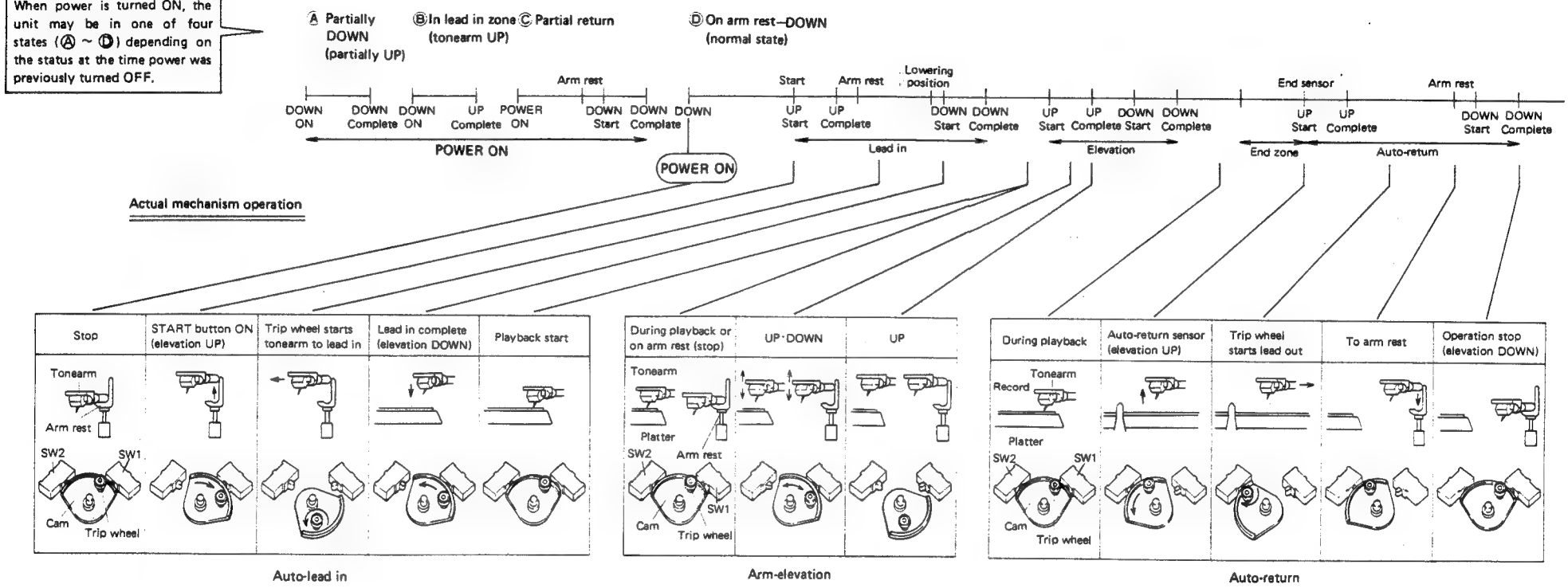
When power is turned ON, the unit may be in one of four states (Ⓐ ~ Ⓓ) depending on the status at the time power was previously turned OFF.



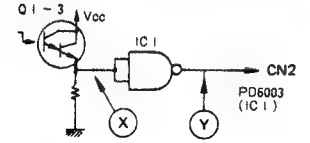
■ TIMING CHART 3

Operational sequence for a single cycle between power ON and automatic stop (full-automatic operation, 17cm record disc).

When power is turned ON, the unit may be in one of four states (Ⓐ ~ Ⓓ) depending on the status at the time power was previously turned OFF.



End B, end A, and lowering position sensor input (sensor PC board assembly)



	End B sensor Q3	End A sensor Q2	Lowering position sensor Q1	
IC1 Input pins	12, 13	8, 9	1, 2	(X) wave-form 5V 0V
IC1 Output pins	11	10	3	(Y) wave-form 5V 0V

※ Input waveform for sensors shown in timing chart 1.

6. DISASSEMBLY

NOTE: A cartridge is not supplied with the KUT type.

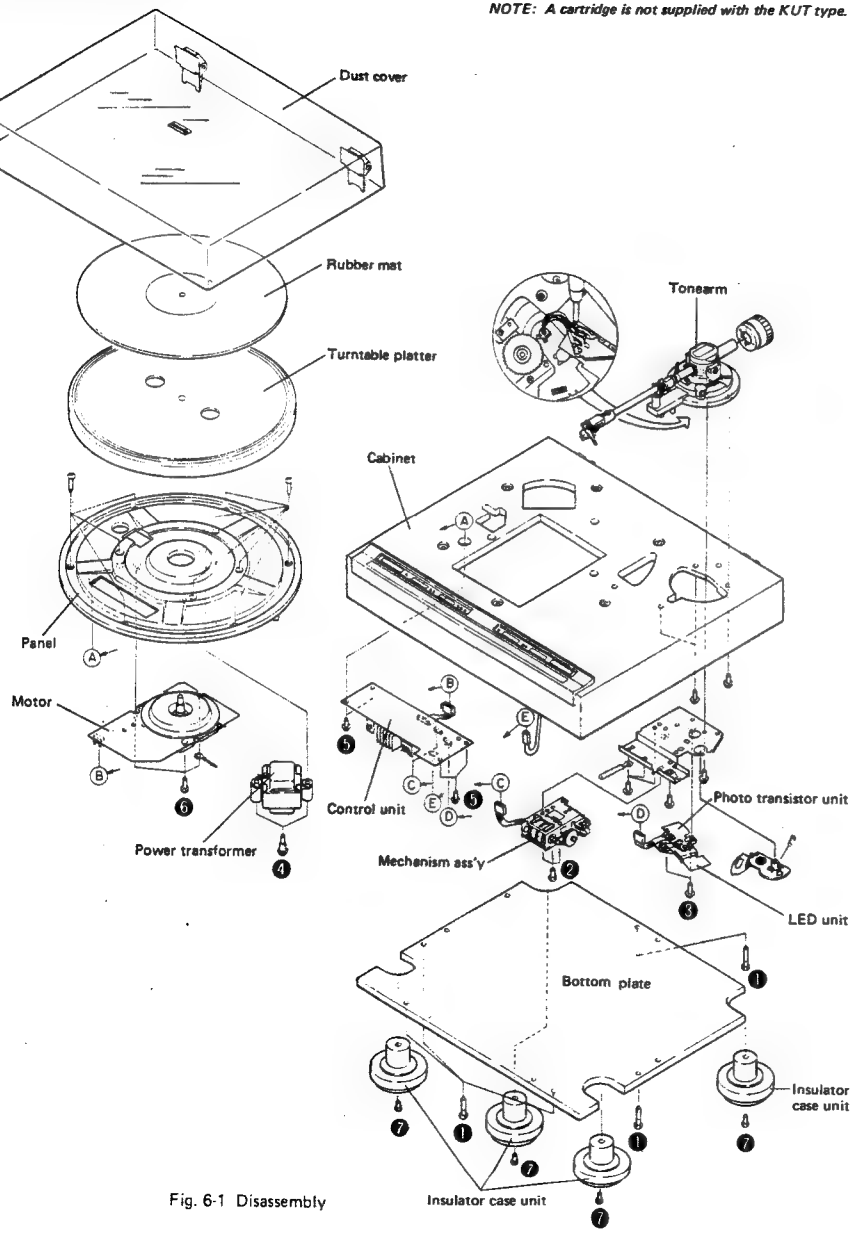


Fig. 6-1 Disassembly

- **Disassembly**

1. Remove the dust cover by pulling upwards.
2. Remove the rubber mat, and then the turntable platter by pulling upwards.
3. After undoing screw ❼ and screwing off the insulator case units, remove the bottom plate by undoing screws ❶ .
4. Disconnect connector C, and undo screw ❷ to remove the mechanism ass'y.
5. Disconnect connector D , and undo screw ❸ to remove the photo transistor and LED units.
6. Undo screw ❹ to remove the power transformer.
7. Disconnect connectors B and E , and undo screws ❺ to remove the control unit.
8. Undo screw ❻ to remove the motor.

- **Tonearm Ass'y Removal**

1. Remove the tonearm lead wire soldering, and undo screw ❶ to remove the sensor ass'y.
2. Undo screw ❷ to remove the ass'y drive mechanism.
3. Loosen screw ❸ to enable the removal of the PU plate and shutter.
4. Undo screw ❹ to remove the tonearm ass'y.

PL-707

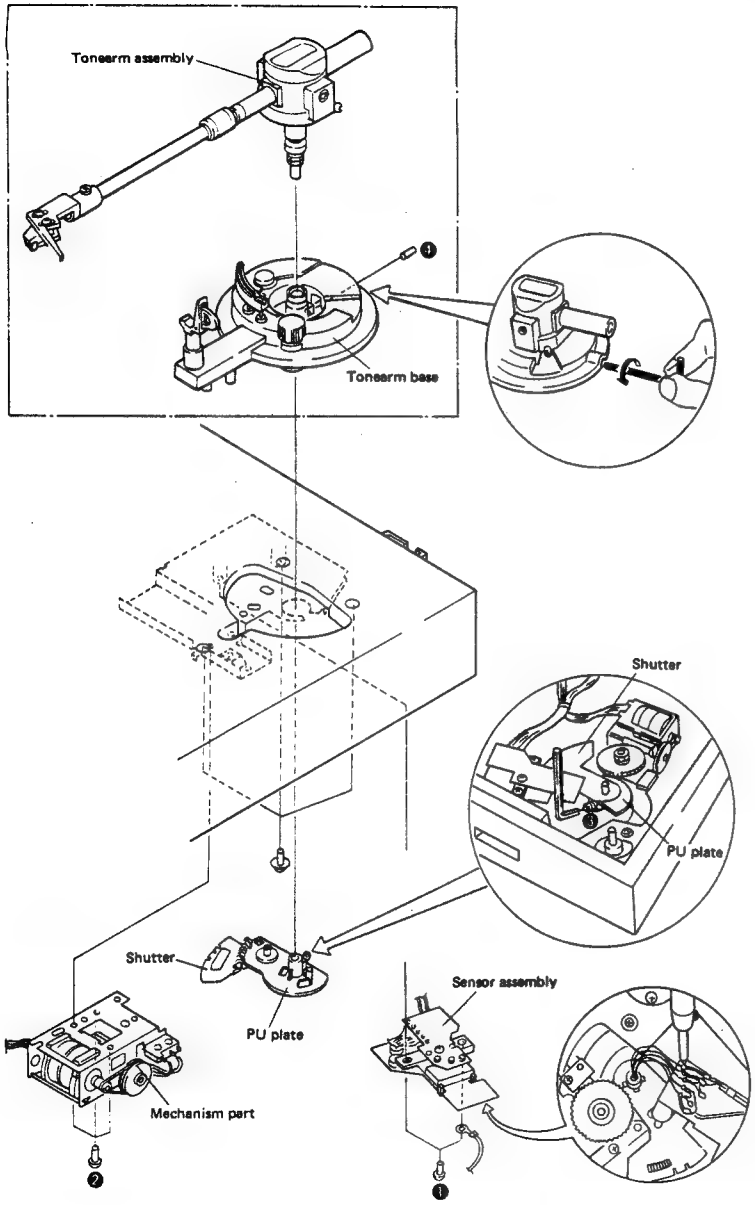


Fig. 6-2 Tonearm part remove.

- **Mounting the PU plate and Shutter**

1. Mount the PU plate aligned with the edge of the shutter.
2. Align point A of the shutter with the triangular mark on the mechanism base unit.
3. Adjust the separation between the PU plate and shutter to 13.8mm. Using a hexagonal wrench, tighten the PU plate in the reverse order to the disassembly procedure.

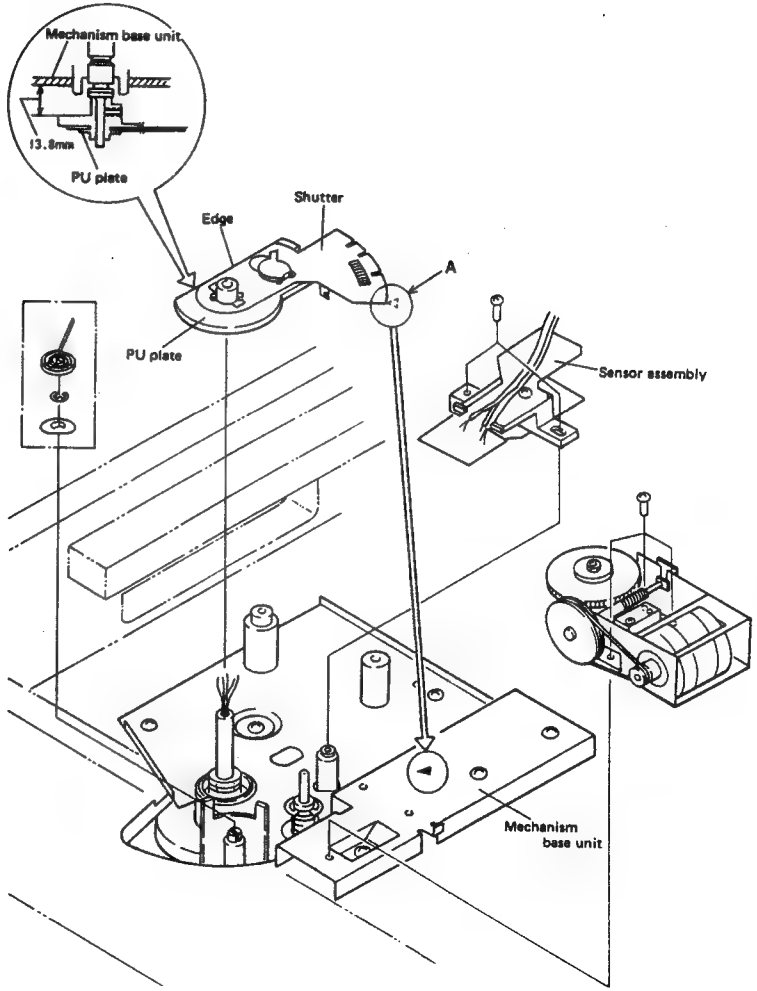


Fig. 6-3 PU plate attachment

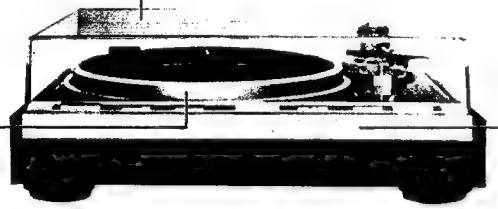
7. PARTS LOCATION

NOTES:

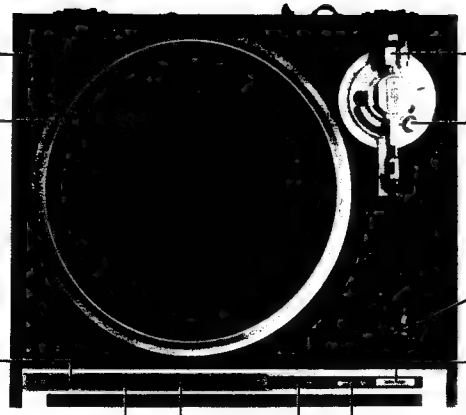
- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your Parts Stock Control, the fast moving items are indicated with the marks ★★ and ★ .*
  ★★ GENERALLY MOVES FASTER THAN ★
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

A cartridge is not supplied with the KUT type.

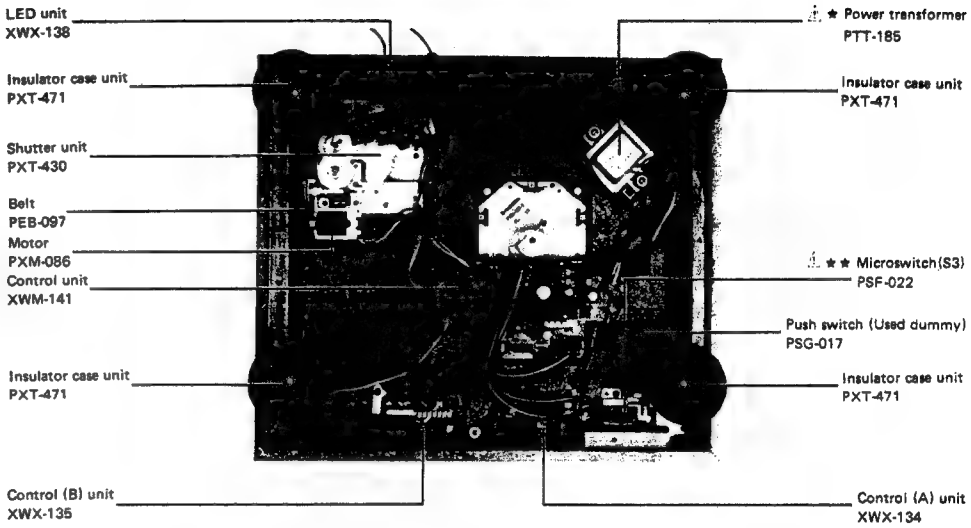
Front Panel View



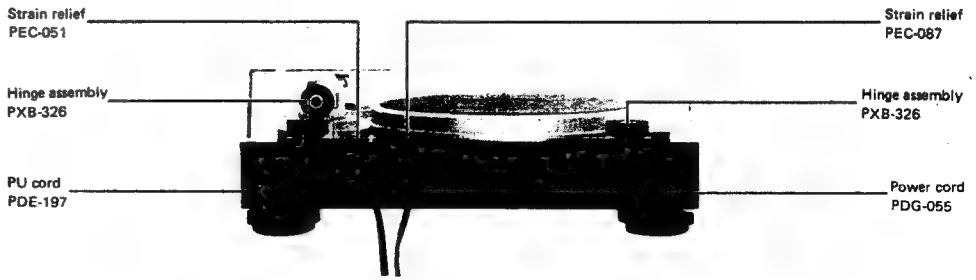
Top View



Bottom View



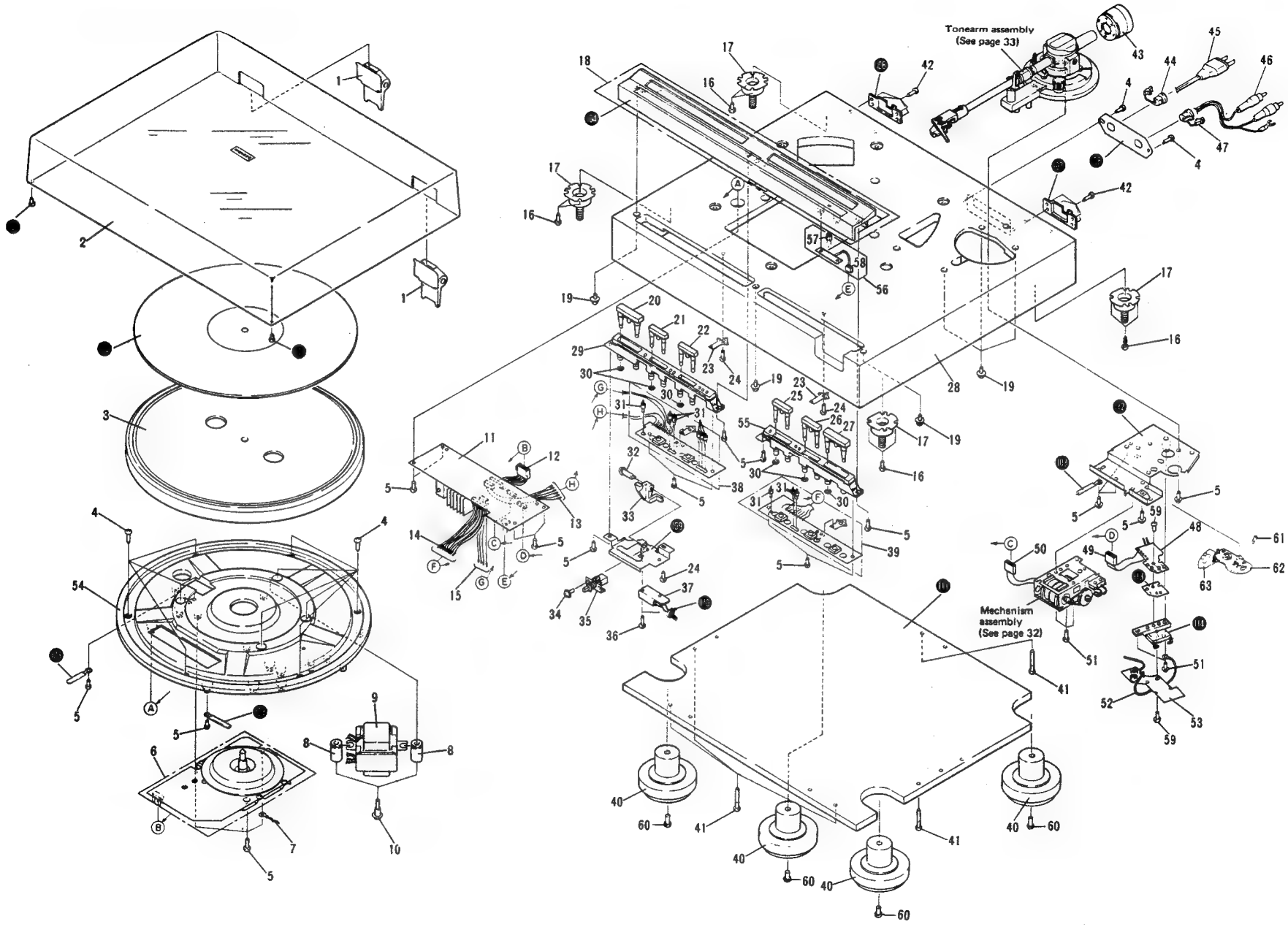
Rear Panel View



8. EXPLODED VIEW AND PARTS LIST

8.1 EXTERIOR

NOTE: A cartridge is not supplied with the KUT type.



PL-707

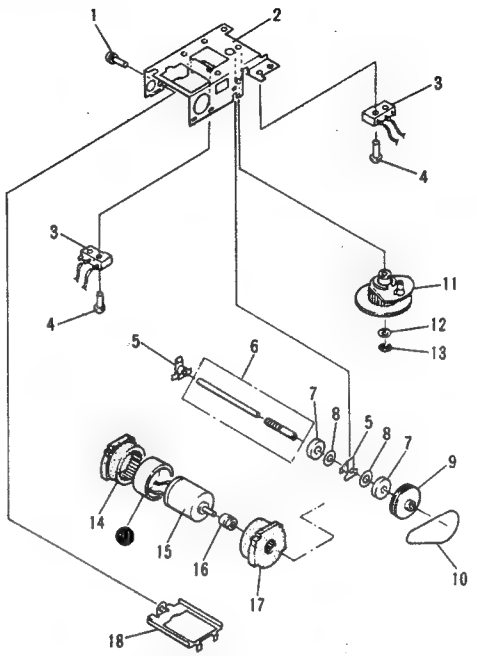
NOTES:

- ***Parts without part number cannot be supplied.***
- ***The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.***
- ***For your Parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.***
  ★★ GENERALLY MOVES FASTER THAN ★
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

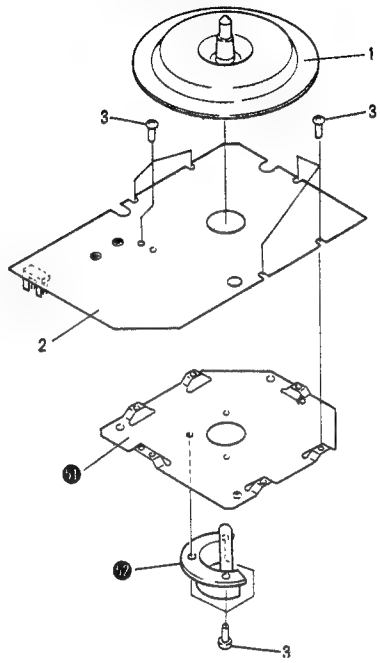
Parts List of Exterior

Mark	No.	Part No.	Description
	1.	PXB-326	Hinge assembly
	2.	PNV-047	Dust cover
	3.	PNR-185	Turntable platter
	4.	PBA-165	Screw
	5.	PPZ30P100FMC	Screw
	6.	PXM-125	Motor
	7.	PDF-192	Earth lead unit
	8.	PEB-250	Base rubber
⚠ ★	9.	PTT-185	Power transformer
	10.	PBA-144	Screw
⚠ ★	11.	XWM-141	Control unit
	12.	PDE-240	Connector assembly (7P)
	13.	PDF-194	Lead wire unit (6P)
	14.	PDF-195	Lead wire unit (8P)
	15.	PDF-193	Lead wire unit (4P)
	16.	PYC40P120FMC	Screw
	17.	PXV-048	Insulator unit (E)
	18.	PXB-331	Front panel assembly
	19.	PBA-159	Screw
	20.	PAD-079	Push button unit (A)
	21.	PAD-080	Push button unit (E)
	22.	PAD-081	Push button unit (C)
	23.	PBK-071	Spring
	24.	PYC40P080FMC	Screw
	25.	PAD-083	Push button unit (D)
	26.	PAD-084	Push button unit (F)
	27.	PAD-082	Push button unit (B)
	28.	PMM-197	Cabinet
	29.	PNY-114	Control case (A)
	30	YS20FBT	Washer
	31.	GL-2PR1	LED
	32.	PBA-104	Screw
	33.	PNX-092	Lever
	34.	iAZ30P060FMC	Screw
★★	35.	PSG-017	Push switch
	36.	PMA30P150FMC	Screw
⚠ ★★	37.	PSF-022	Microswitch S3
	38.	XWX-134	Control (A) unit
	39.	XWX-135	Control (B) unit
	40.	PXT-471	Insulator case unit
	41.	PBA-168	Screw
	42.	PYC30P120FZK	Screw
	43.	PXB-566	Weight assembly
	44.	PEC-087	Strain relief
	45.	PDG-055	Power cord
	46.	PDE-197	PU cord
	47.	PEC-051	Strain relief
	48.	XWX-137	Photo transistor unit
	49.	PDE-223	Connector assembly (5P)
	50.	PDE-090	Connector assembly (5P)
	51.	PDZ30P080FMC	Screw
	52.	PDF-200	Earth lead wire unit
	53.	XWX-138	LED unit
	54.	PNY-049	Panel
	55.	PNY-066	Control case (B)
	56.	XWX-136	Start unit
	57.	GL9PR12	LED
	58.	PDE-225	Connector assembly (2P)
	59.	PPZ30P080FMC	Screw
	60.	BMZ40P080FMC	Screw
	61.	ZMD40H140FZK	Screw
	62.	PNY-127	PU plate
	63.	PXT-430	Shutter unit
	101.		Rubber foot
	102.		Rubber mat
	103.		Cord clamper
	104.		Front panel
	106.		Plate (L)
	107.		Plate (R)
	108.		Cord holder
	109.		Switch base
	110.		Cord fixer
	111.		Bottom plate
	112.		Mechanism base unit
	113.		Slit plate
	114.		Spacer

8.2 MECHANISM ASSEMBLY



8.3 MOTOR ASSEMBLY



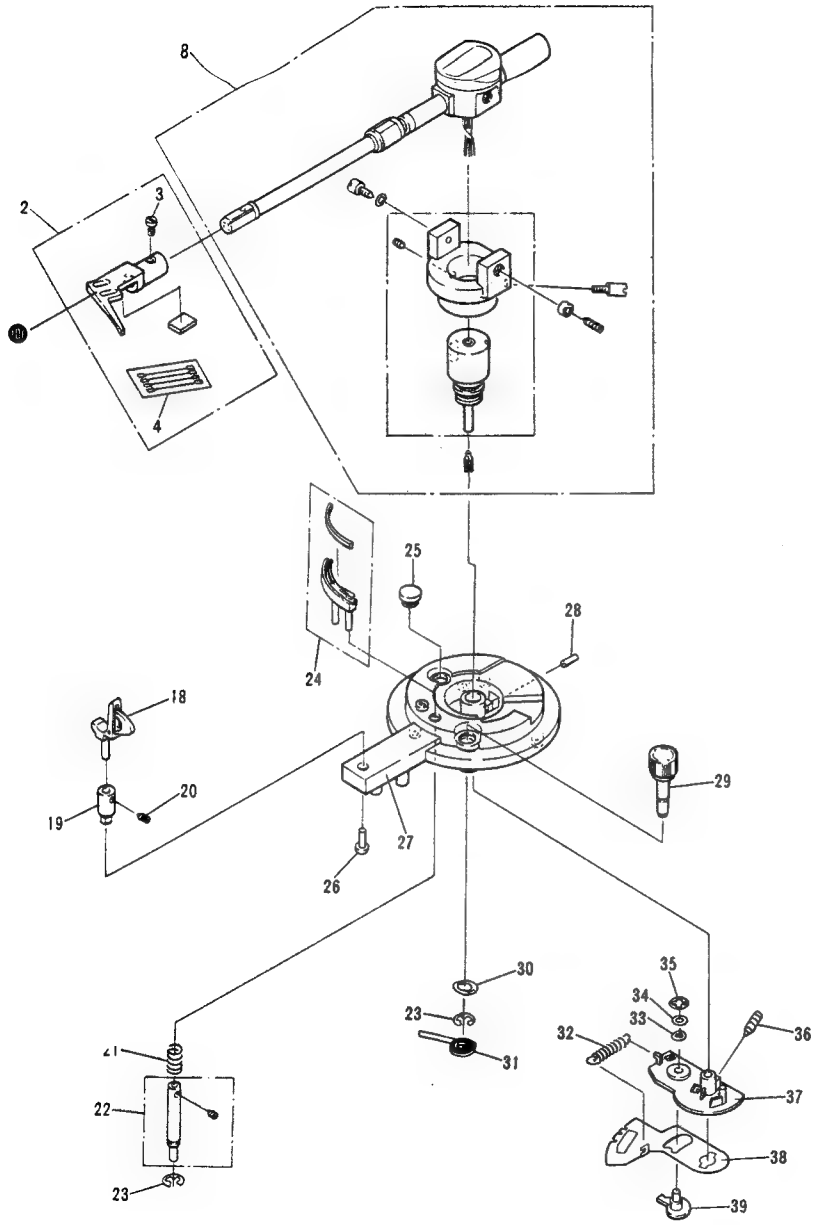
Parts List of Mechanism

Mark	No.	Part No.	Description
	1.	PMA26P050FMC	Screw
	2.	PXT-322	Chassis unit (F)
★★	3.	PSF-016	Microswitch
	4.	PMZ20G100FMC	Screw
	5.	PNW-391	Collar
	6.	PNW-485	Worm unit
	7.	PED-010	Felt washer
	8.	PBF-009	Nylon washer
	9.	PNW-393	Pulley
	10	PEB-097	Belt
	11.	PYY-117	Gear (F) assembly
	12.	WA31D054D050	Washer
	13.	YE25S	Washer
	14.	PEB-249	Damper rubber (B)
	15.	PXM-086	Motor
	16.	PLM-008	Motor pulley
	17.	PEB-248	Damper rubber (A)
	18.	PNC-300	Frame
	51.		Shield plate

Parts List of Motor

Mark	No.	Part No.	Description
	1.	PXV-029	Rotor unit
	2.	PWM-138	Circuit unit
	3.	PSZ30P060FMC	Screw
	51.		Base
	52.		Spindle base unit

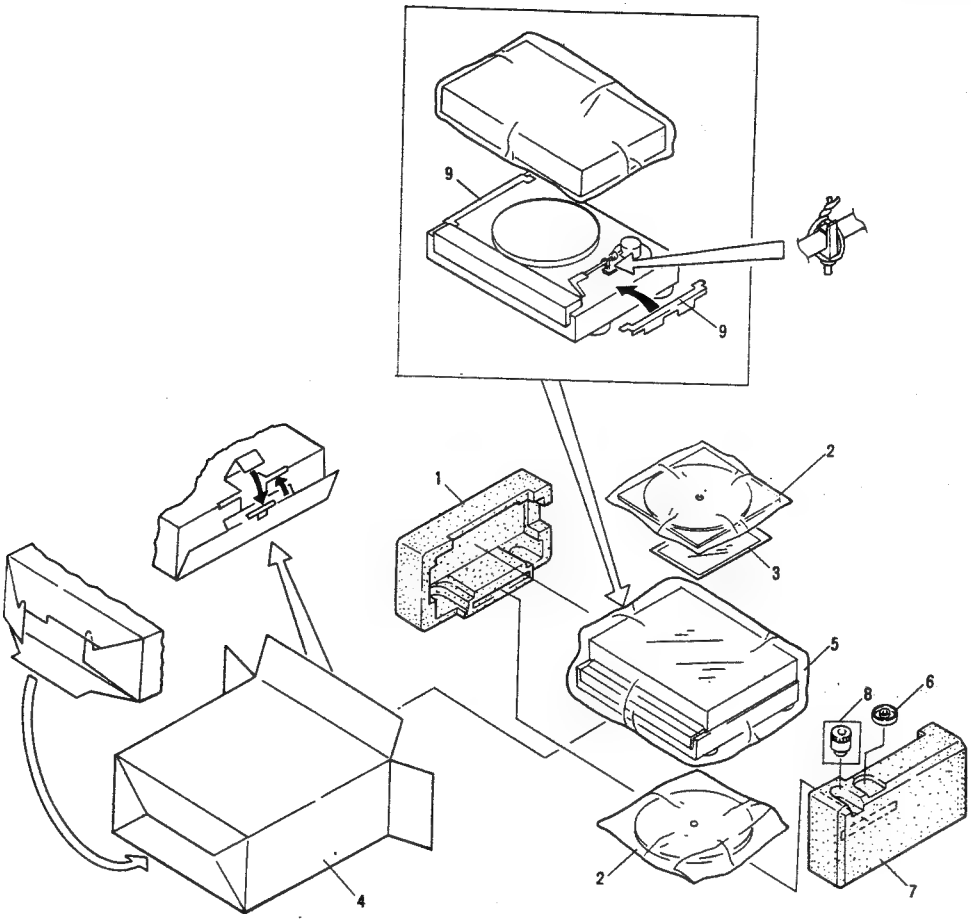
8.4 TONEARM ASSEMBLY



Parts List of Tonearm

Mark	No.	Part No.	Description
	1.		
	2.	PXB-564	Headshell assembly
	3.	PBA-533	Screw
	4.	PDF-544	Terminal chip unit
	5.		
	6.		
	7.		
	8.	PPD-640	Tonearm assembly
	9.		
	10.		
	11.		
	12.		
	13.		
	14.		
	15.		
	16.		
	17.		
	18.	PXB-325	Arm rest assembly
	19.	PLB-208	Rest shaft holder
	20.	ZMK30M030FNi	Screw
	21.	PBH-166	EV spring
	22.	PLB-207	EV shaft
	23.	YE50S	Washer
	24.	PXB-210	EV sheet assembly
	25.	PEB-255	Rubber bush
	26.	PMZ30P060FMC	Screw
	27.	PNY-047	Tonearm base
	28.	ZMK40M080FZK	Screw
	29.	PAD-128	AS knob unit
	30.	PBE-012	AS spring washer
	31.	PBH-268	AS spring
	32.	PBH-364	PU plate spring
	33.	PBE-019	PU spring washer
	34.	WC40FMC	Washer
	35.	YS40S	Washer
	36.	ZMD40H140FZK	Screw
	37.	PNY-127	PU plate
	38.	PXT-430	Shutter unit
	39.	PNW-592	Adjustment cam
	101.		Head shell
	102.		Stylus

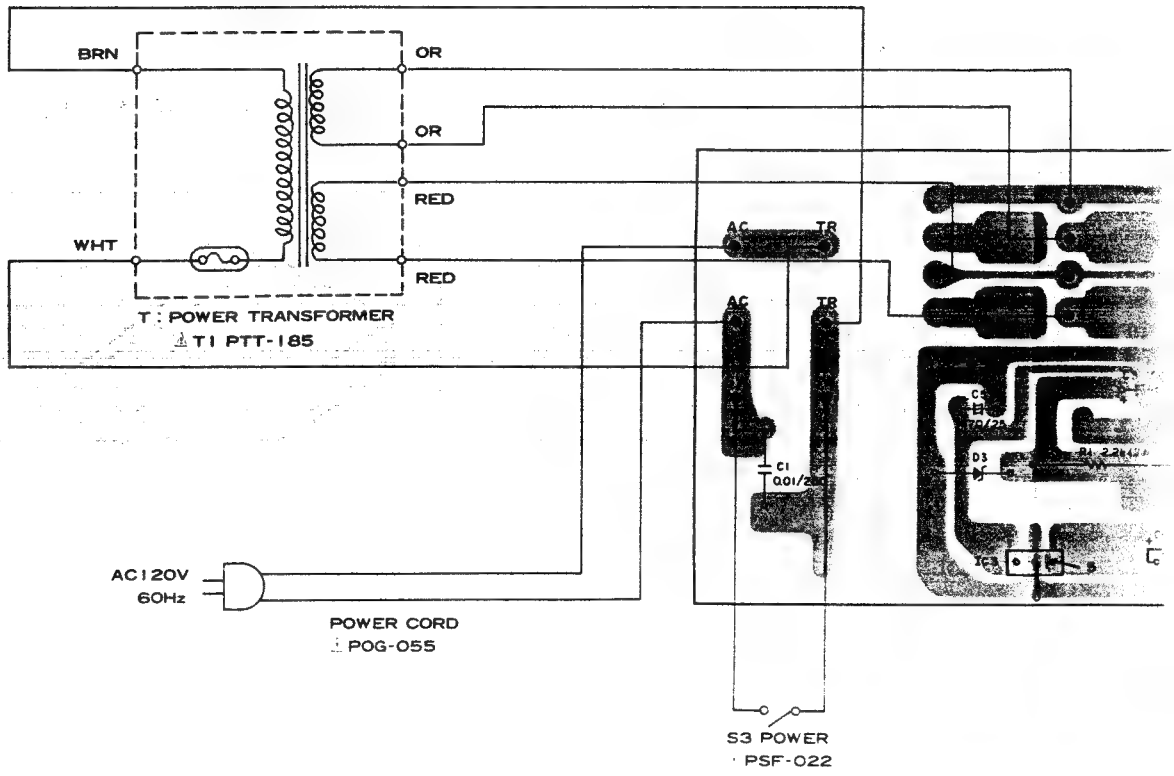
9. PACKING



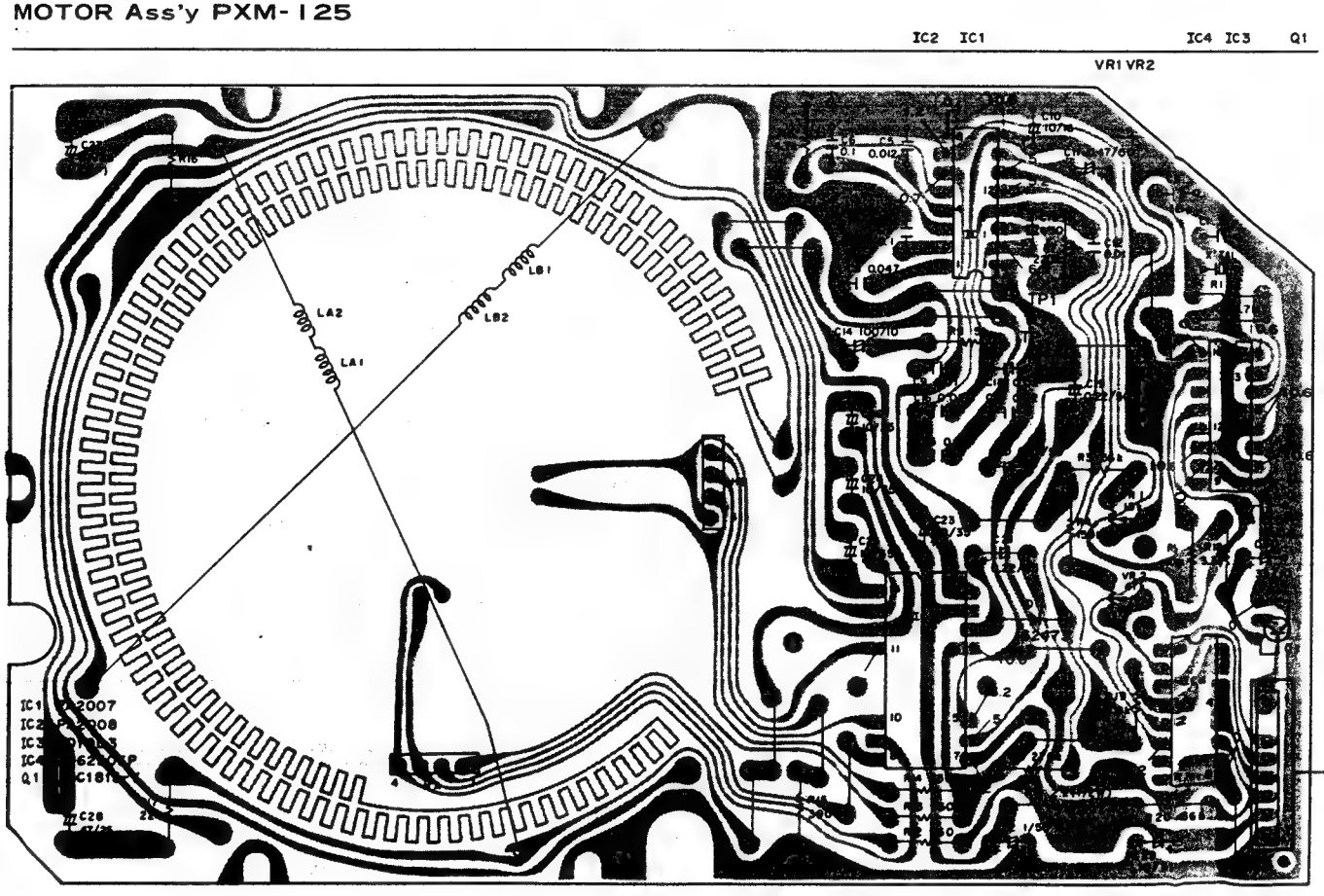
PACKING

Mark	No.	Part No.	Description	Mark	No.	Part No.	Description
	1.	PHA-154	Protector (L)		6.	N93-603	EP adaptor
	2.	PEA-065	Rubber mat assembly		7.	PHA-155	Protector (R)
	3.	*PRB-231*	*Operating instructions*		8.	PXB-566	Weight assembly
	4.	PHH-048	Packing case		9.	PHC-096	Spacer
	5.	PHL-026	Sheet				

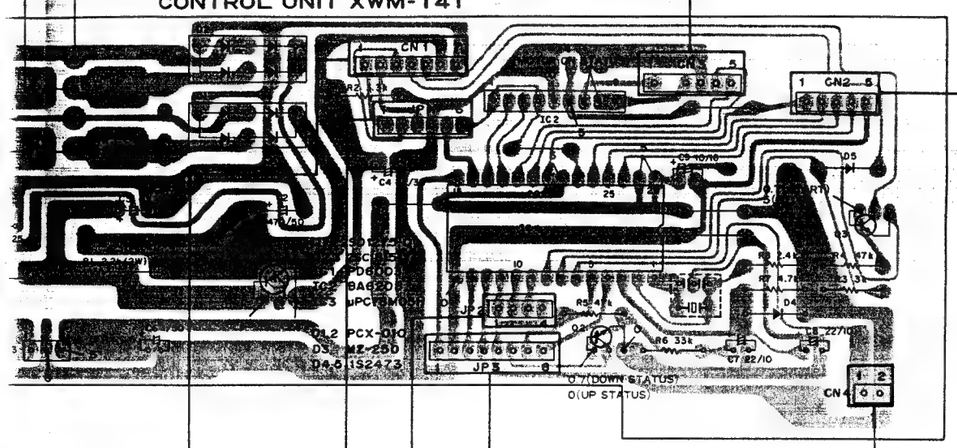
10. P.C.BOARDS CONNECTION DIAGRAM



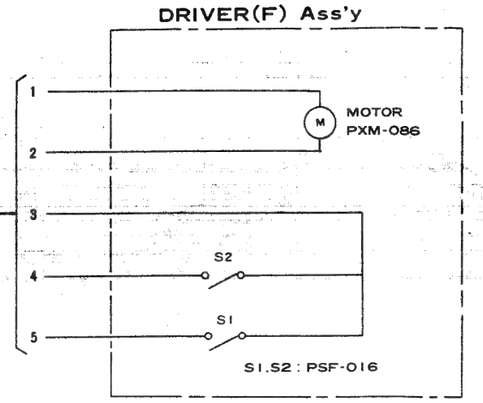
MOTOR Ass'y PXM-125

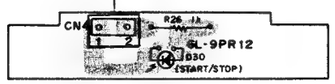


CONTROL UNIT XWM-141



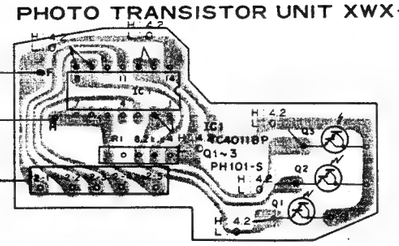
DRIVER(F) Ass'y

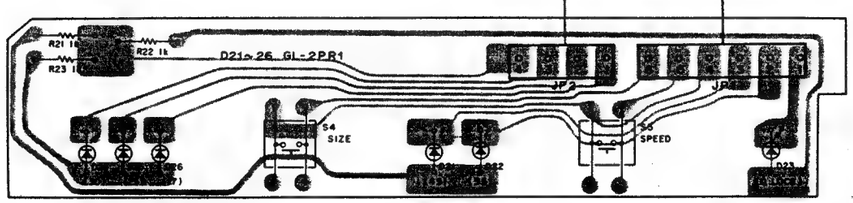




START UNIT XWX-136

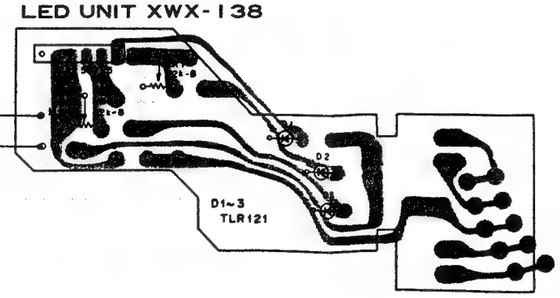
PHOTO TRANSISTOR UNIT XWX-137

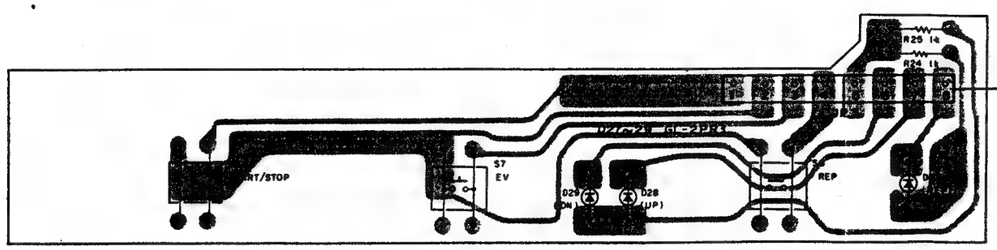




CONTROL(A) UNIT XWX-134

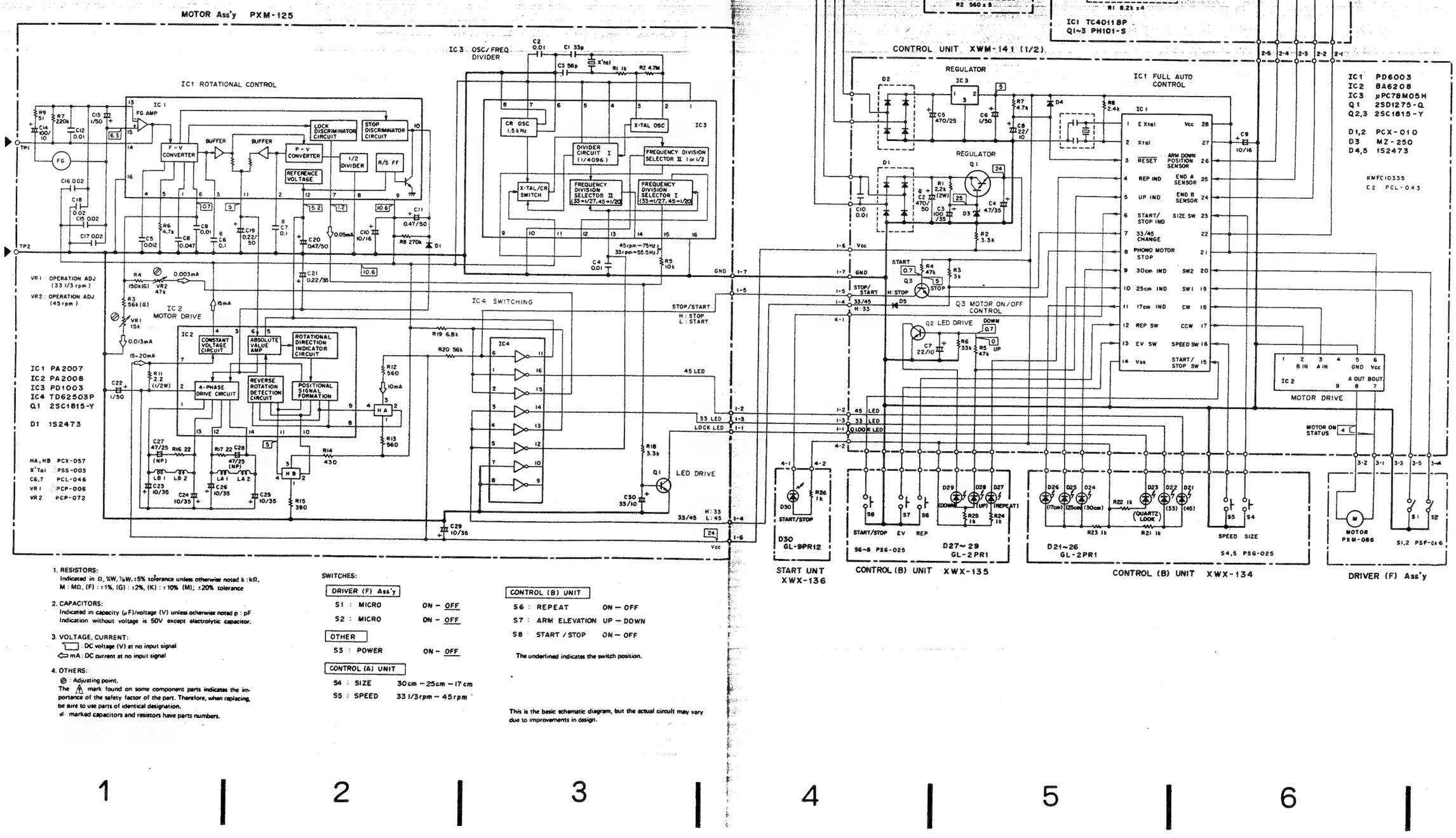
LED UNIT XWX-138





CONTROL (B) UNIT XWX-135

11. SCHEMATIC DIAGRAM



1. RESISTORS:
Indicated in Ω, ¼W, ⅛W, ±5% tolerance unless otherwise noted k : kΩ, M : MΩ, (F) : ±1%, (G) : ±2%, (K) : ±10% (M); ±20% tolerance

2. CAPACITORS:
Indicated in capacity (μF)/voltage (V) unless otherwise noted p : pF
Indication without voltage is 50V except electrolytic capacitor.

3. VOLTAGE, CURRENT:
: DC voltage (V) at no input signal
: mA : DC current at no input signal

4. OTHERS:
: Adjusting point.
The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.
marked capacitors and resistors have parts numbers.

SWITCHES:

DRIVER (F) Ass'y
- S1 : MICRO ON – OFF
- S2 : MICRO ON – OFF

OTHER
- S3 : POWER ON – OFF

CONTROL (A) UNIT
- S4 : SIZE 30cm – 25cm – 17cm
- S5 : SPEED 33 1/3rpm – 45rpm

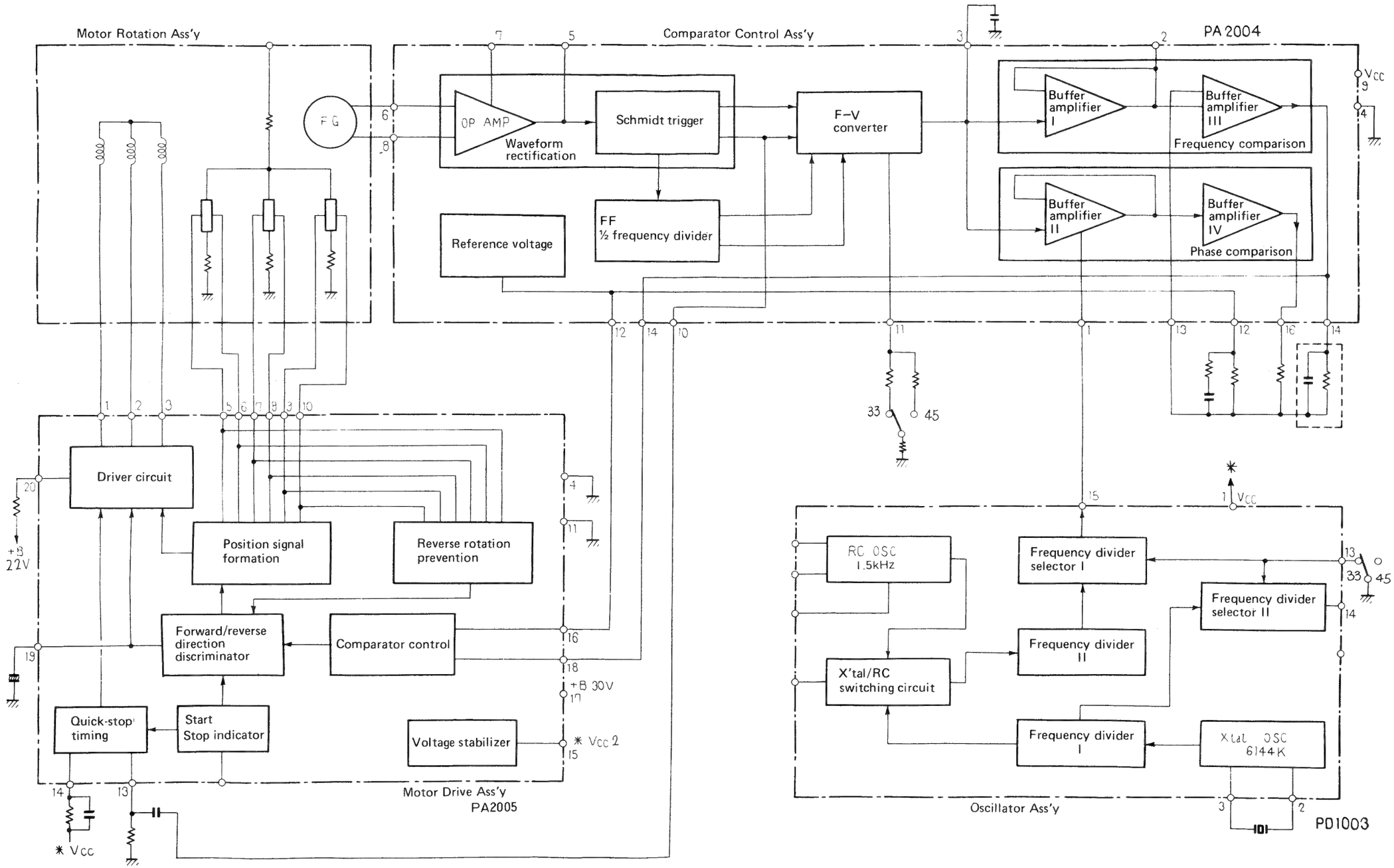
CONTROL (B) UNIT
- S6 : REPEAT ON – OFF
- S7 : ARM ELEVATION UP – DOWN
- S8 : START / STOP ON – OFF

The underlined indicates the switch position.

This is the basic schematic diagram, but the actual circuit may vary due to improvements in design.

9. D.D. MOTOR CIRCUIT DESCRIPTIONS AND TROUBLE SHOOTING

9.1 BLOCK DIAGRAM



9.3 OPERATION OF THE PD1003 IC (OSCILLATOR STAGE)

1. Once the power supply is turned on, the quartz crystal oscillator generates a 6144kHz signal.
2. The frequency of this signal is reduced to 1.5kHz (1/4096 division) by frequency divider I. Part of the resultant signal is passed via the x'tal/RC switching circuit and applied to frequency divider II. The other part of the signal is applied to frequency divider selector II.
3. The 1.5kHz signal applied to frequency divider II is further divided into a 750Hz signal, and applied to frequency divider selector I where the signals are converted into sampling pulses for phase comparison purposes in PA2004.
   33rpm 27.78Hz
   45rpm 37.5Hz
   (In both cases, the pulse width is 0.667ms).
4. Frequency divider selector II converts signals from frequency divider I into pulse signals for the stroboscope lamp drive circuit.
   33rpm 55.5Hz
   45rpm 75.0Hz
   (In both cases, the pulse width is again 0.667ms).
5. The oscillation frequency (1.5kHz) of the RC o.s.c. block can be varied by ±6% with the SPEED ADJ control.
6. Since the reference signal is varied with the SPEED ADJ at Quartz Lock OFF, the speed of the turntable is also variable ±6%.

9.4 OPERATION OF THE PA2004 IC (COMPARATOR CONTROL)

1. Signals from the frequency generator in the motor rotation ass'y are changed into 50% duty square wave signals by the waveform rectifier. The frequencies at this stage are thus,
   33rpm 55.55Hz
   45rpm 75Hz
2. Part of the output is divided by ½ in the FF circuit, and subsequently applied to the FV converter circuit along with the other part of the output formed in step 1 above, thereby forming the FV converter gate pulse signals.
3. The output from the FV converter is applied to buffer amplifiers I and II.
4. The buffer amplifier I output is compared with the reference voltage in buffer amplifier III, and then applied to the output compose circuit.
5. Phase comparison of the sampling pulses from the PD1003 IC with the FV converter output occurs in buffer amplifier II, with the resultant output being applied to buffer amplifier IV.
6. The output from buffer amplifier IV is also applied to the output compose circuit.
7. This output compose circuit consists of a low-pass filter (cut-off frequency 23Hz, cut-off slope —6dB/oct.) which serves to eliminate the carrier component in the output of buffer amplifier II (phase comparison).
8. This final output signal is then passed onto the comparator control stage of the PA2005 IC for comparison with the reference voltage.

9.5 OPERATION OF THE PA2005 IC (DRIVE CONTROL)

- Start/stop indicator stage

1. The input signal to this stage is applied by means of an external start/stop switch. In the PL-630, this switch is a photo-transistor switch activated by tonearm movement.
2. If the switch is turned on when the motor is stationart, a start signal is generated, and is used to start up the drive circuit.
3. If the switch is turned on when the motor is rotating, the forward/reverse direction discriminator circuit will be notified of the subsequent generation of a reverse torque.
4. At the same time, a stop signal is applied to the quick-stop timing circuit.

- Quick stop timing circuit

1. The motor will rapidly stop as a result of the reverse torque generated by the stop signal.
2. When the turntable speed drops, the signal of Fig. 10-b will appear at the quick stop timing circuit (Pin 13 of PA2005).
3. As a result of this signal, the waveform at pin 14 of PA2005 will become as shown in Fig. 10-c.
4. When the motor speed falls off, the signal level at pin 14 of PA2005 will exceed the fixed value, whereupon the drive circuit will go off.
5. Subsequently, the turntable will continue to rotate under its own inertia for a brief interval and then stop.

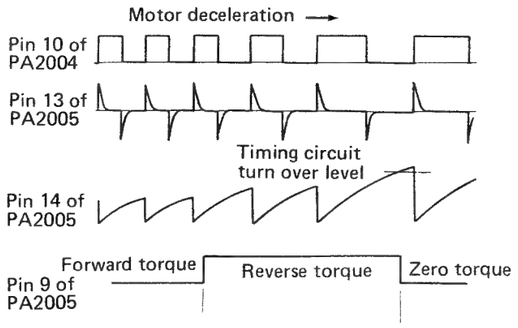


Fig. 20

- **Stroboscope Pulse Circuit**

1. The platter has only a single row of stroboscopic markings. Switchover for 45 and 33 rpm is effected by changing the frequency of the pulse to the stroboscopic lamp.
2. From the Frequency Divider Selector I, a frequency of either 75Hz (for 45 rpm, representing 1/80 of 6000Hz) or 55.5Hz (for 33 rpm, representing 1/108) is obtained and supplied to the transistor that drives the stroboscopic lamp.

- **Reverse Rotation Prevention**

1. PXM-061 operates indiscriminately in regard to the direction of rotation. If the platter is turned slowly in the reverse direction by hand, a forward torque will be applied until the platter stops, reverses its rotation and reaches rated speed in the proper direction.
2. If, however, the rotational speed in the reverse direction is in excess of 33 or 45 rpm, the Forward/Reverse Command Block may "misread" this as simply excessive speed ("overrun") and apply a reverse torque until rated speed is attained.
3. This reverse torque will further accelerate the turntable rotation in the reverse direction. This is known as "reverse run-away."
4. To prevent this from happening, a Reverse Rotation Prevention circuit has been included.
5. This Reverse Rotation Prevention circuit consists of two flip-flops and AND gates See Fig. 21.
6. The input for this circuit is derived from the Hall element position detection signals processed in the Reverse Rotation Prevention circuit.
7. As long as the platter is rotating in the proper direction, this pulse enters in the order B — A — C, and no "reverse" command is generated.
8. If, however, the platter rotates in the reverse direction, the pulse order becomes A — B — C, and a corrective command is given to the Forward/Reverse Command Circuit.

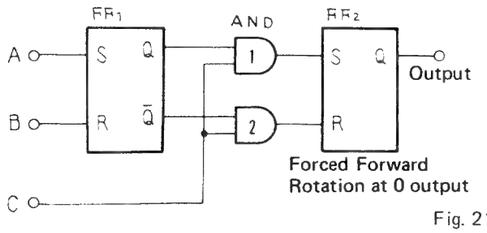


Fig. 21

		FF1				C	AND		FF2
		S	R	Q	Q̄		1out	2out	Q
Forward rotation	B	0	1	0	1	0	0	0	
	↓								
	A	1	0	1	0	0	0	0	
	↓								
	C	0	0	1	0	1	1	0	1
Reverse rotation									
	A	1	0	1	0	0	0	0	
	↓								
	B	0	1	0	1	0	0	0	
	↓								
	C	0	0	0	1	1	0	1	0

Truth table

- **Comparator Control and Forward/Reverse Command Circuit**

1. Two inputs are supplied to the Control Comparator: a) a 4V reference voltage from the voltage stabilizer; and b) the output from the active filters, which serves as the detection signal.
2. If the turntable rotates faster than rated speed, the detection signal is higher than the 4V reference.
3. When this happens, the Comparator Control sends a command to the Forward/Reverse Command Circuit, telling it to apply a reverse torque to the motor to slow it down.
4. Conversely, if turntable rotation is below rated speed, the detection signal voltage will be below the 4V reference.
5. In this case, the Comparator Control indicates to the Forward/Reverse Command Circuit that forward torque must be applied to the motor to accelerate it.

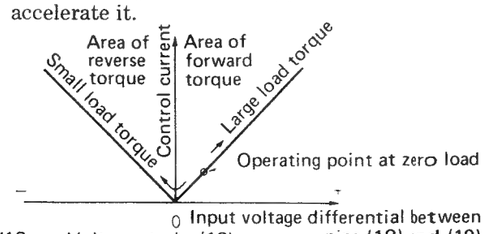
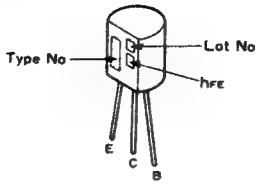


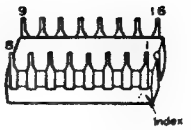
Fig. 22

External Appearance of Transistors and ICs

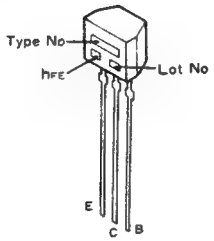
2SC945
2SC1815



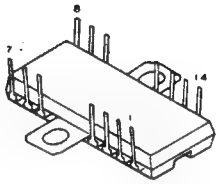
PA2007
PD1003
TD62503P



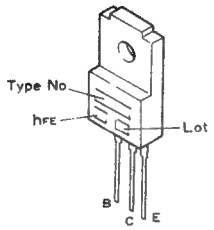
2SC2458



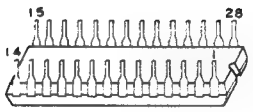
PA2008



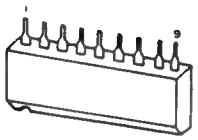
2SD1275



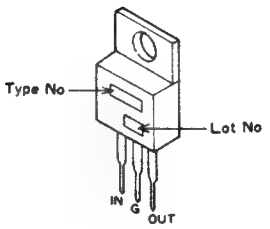
PD6003



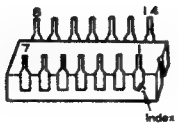
BA6208



μPC78M05H



MB84011B
TC4011BP



PH101

12. ELECTRICAL PARTS LIST

NOTES:

- *When ordering resistors, first convert resistance values into code form as shown in the following examples.*
  Ex. 1 When there are 2 effective digits (any digit apart from 0), such as 560 ohm and 47k ohm (tolerance is shown by J=5%, and K=10%).

560Ω	56 × 10¹	561	RD¼PS □□□J J
47kΩ	47 × 10³	473	RD¼PS □□□J J
0.5Ω	0R5		RN2H □□□□ K
1Ω	010		RS1P □□□□ K

  Ex. 2 When there are 3 effective digits (such as in high precision metal film resistors).

5.62kΩ	562 × 10¹	5621	RN¼SR □□□□ F

- *The ⚠ mark found on some component parts indicates the importance of the safety factor of the part. Therefore, when replacing, be sure to use parts of identical designation.*
- *For your Parts Stock Control, the fast moving items are indicated with the marks ★★ and ★.*
  ★★ GENERALLY MOVES FASTER THAN ★
  This classification shall be adjusted by each distributor because it depends on model number, temperature, humidity, etc.

ASSEMBLY AND OTHERS

Mark	Part No.	Symbol & Description
⚠	XWM-141	Control unit
	XWX-134	Control (A) unit
	XWX-135	Control (B) unit
	XWX-136	Start unit
	XWX-137	Photo transistor unit
	XWX-138	LED unit
	PWM-138	Circuit unit
⚠ ★	PTT-185	Power transformer
★★	PSF-016	S1, S2 Microswitch
★★		Push switch
⚠ ★★	PSF-022	S3 Microswitch
	PXM-125	Motor
	PXM-086	Motor

CONTROL UNIT (XWM-141)

SEMICONDUCTORS

Mark	Part No.	Symbol & Description
★★	PD6003	IC1
★★	BA6208	IC2
★★	μPC78M05H	IC3
★	2SC1815	Q2, Q3
★	2SD1275	Q1
★	1S2473 (1S1555)	D4, D6
★	PCX-010	D1, D2
★	MZ-250 (WZ-250)	D3

CAPACITORS

Mark	Part No.	Symbol & Description
⚠	PCL-040	C1
	CEA 1R0M 50L	C6
	CEA 100M 16L	C9
	CEA 101M 35L	C3
	CEA 220M 10L	C7, C8
	CEA 4R7M 35L	C4
	CEA 471M 25L	C5
	PCL-043	C2
	CKDYF 103Z50	C10

RESISTORS

NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

Mark	Part No.	Symbol & Description
	RS2PF222J	R1 RS2PF222J
	RD1/4PM □□□J	R2 – R8

OTHERS

Mark	Part No.	Symbol & Description
	PKC-016	T1, T2
	PKC-010	T3
	PDE-240	CN1 Connector assembly (7P)
	PDF-194	JP1 Lead wier unit (6P)
	PDF-193	JP2 Lead wier unit (4P)
	PDF-195	JP3 Lead wier unit (8P)
	KMFC1033S	
	VZB30P060FMC	Screw
	PMZ30P060FMC	Screw

CONTROL (A) UNIT (XWX-134)

Mark	Part No.	Symbol & Description
★★	PSG-025	S4, S5 Switch
	RD1/4PM102J	R21 – R23 Resistor

CONTROL (B) UNIT (XWX-135)

Mark	Part No.	Symbol & Description
	PSG-025	S6 – S8 Switch
	RD1/4PM102J	R24, R25 Resistor

START UNIT (XWX-136)

Mark	Part No.	Symbol & Description
★	GL9PR12	D30 LED
	RD1/4PM102J	R26 Resistor
	PDE-225	CN4 Connector assembly (2P)

PHOTO TRANSISTOR UNIT (XWX-137)

Mark	Part No.	Symbol & Description
★★	PH101-S	Q1 – Q3
★★	TC40118P (MB84011B)	IC1
	RGSD4X822J	R1
	PDE-223	Connector assembly (5P)

LED UNIT (XWX-138)

Mark	Part No.	Symbol & Description
★	TLR121	D1 – D3
	PCP-013	VR1, VR2 Semi-fixed (22k-B)
	RGSD5X561J	R2
	PDF-192	Earth lead wire unit
	PDF-200	Earth lead wire unit
	PPZ30P080FMC	Screw

CIRCUIT UNIT (PWM-138)

SEMICONDUCTORS

Mark	Part No.	Symbol & Description
★★	PA2007	IC1
★★	PA2008	IC2
★★	PD1003	IC3
★★	TD62503P	IC4
★★	2SC1815 (2SC945) (2SC2458)	Q1
★	PCX-057	HA, HB Hall element
	PSS-003	X'tal
★	1S2473	D1

CAPACITORS

Mark	Part No.	Symbol & Description
	CQMA 123K 50	C5
	CQPA 473J 50	C8
	CKDYF 103Z 50	C2, C4, C9, C12
	CKDYF 223Z 50	C15 – C18
	CCDCH 330J 50	C1
	CCDCH 560J 50	C3
	PCL-046	C6, C7
	CEANL R22M 50	C19
	CEA R47M 50	C11, C20
	CEA 010M 50	C13, C22
	CEA 100M 16	C10
	CEA 100M 35	C23 – C26, C29
	CEA 330M 10	C30
	CEA 101M 10	C14
	CSZA R22M 35	C21
	CEANP 470M 25	C27, C28

RESISTORS

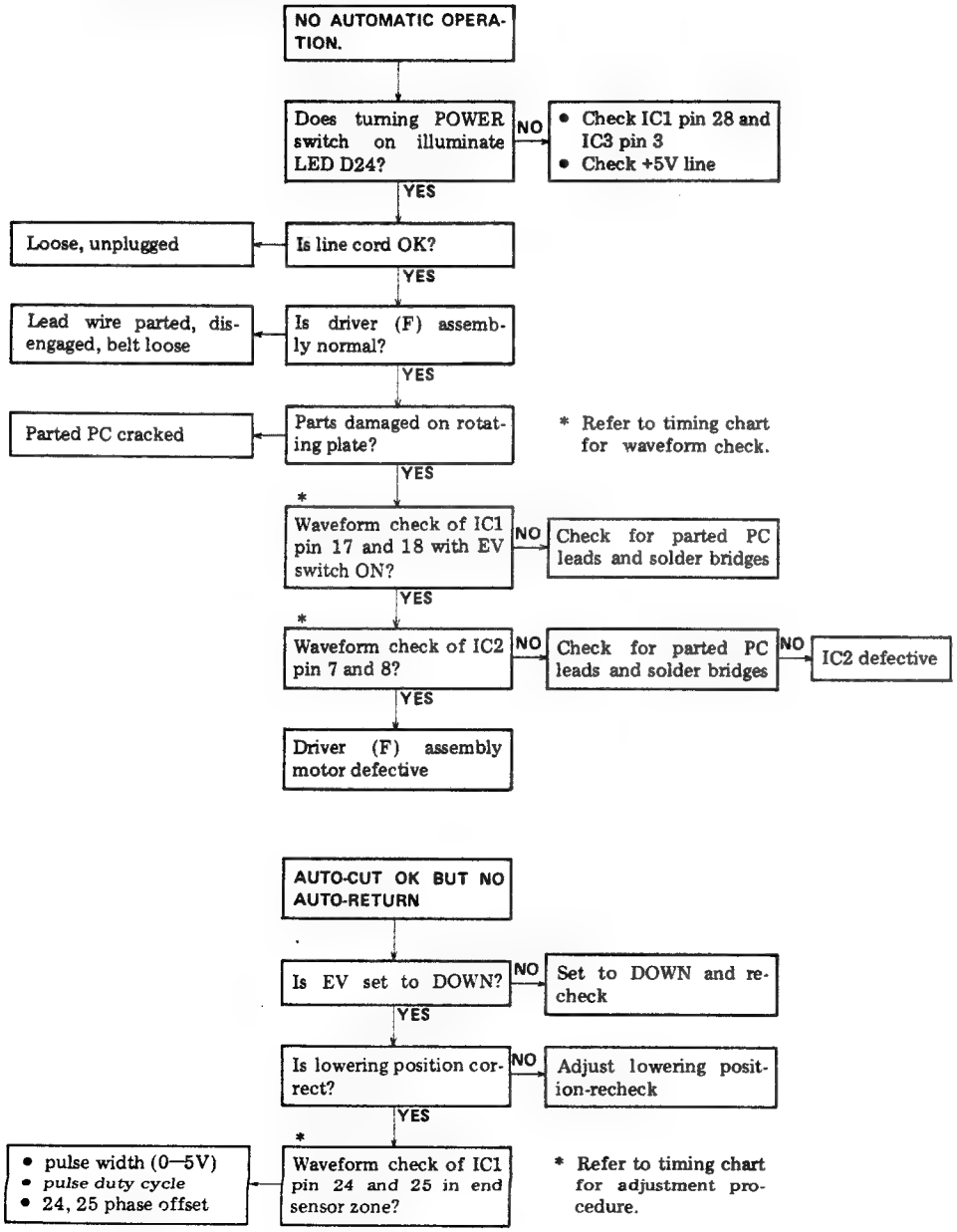
NOTE: When ordering resistors, convert the resistance value into code form, and then rewrite the part no. as before.

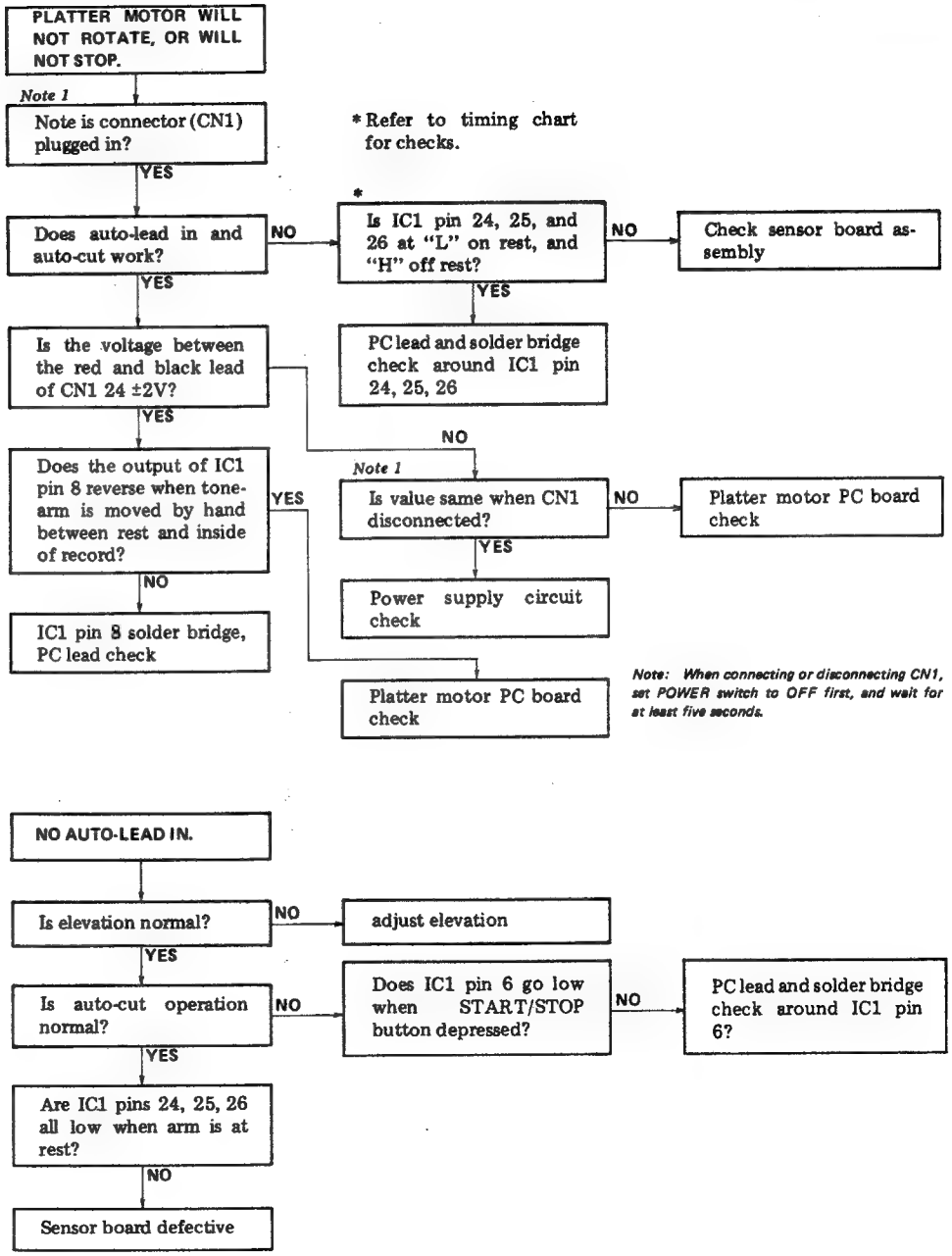
Mark	Part No.	Symbol & Description
	PCP-006	VR1 Semi-fixed (15k-B)
	PCP-072	VR2 Semi-fixed (47k-B)
	RN1/4PR563G	R3
	RN1/4PR154G	R4
	RD1/2PS2R2J	R11
	RD1/4PM □□□J	Others

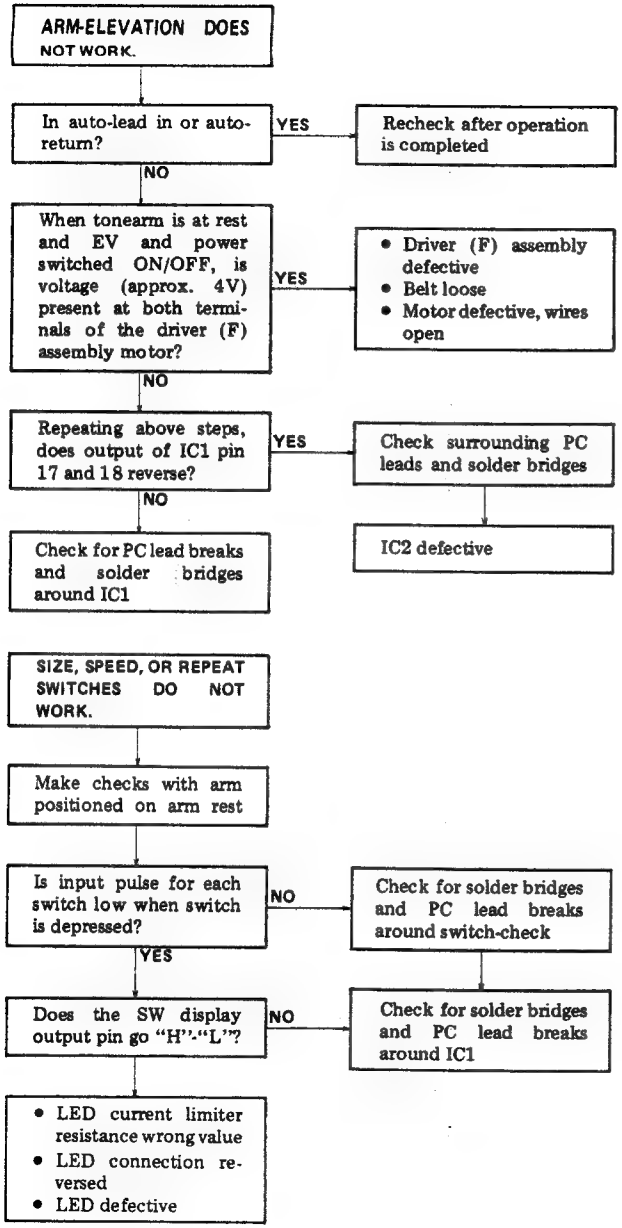
OTHERS

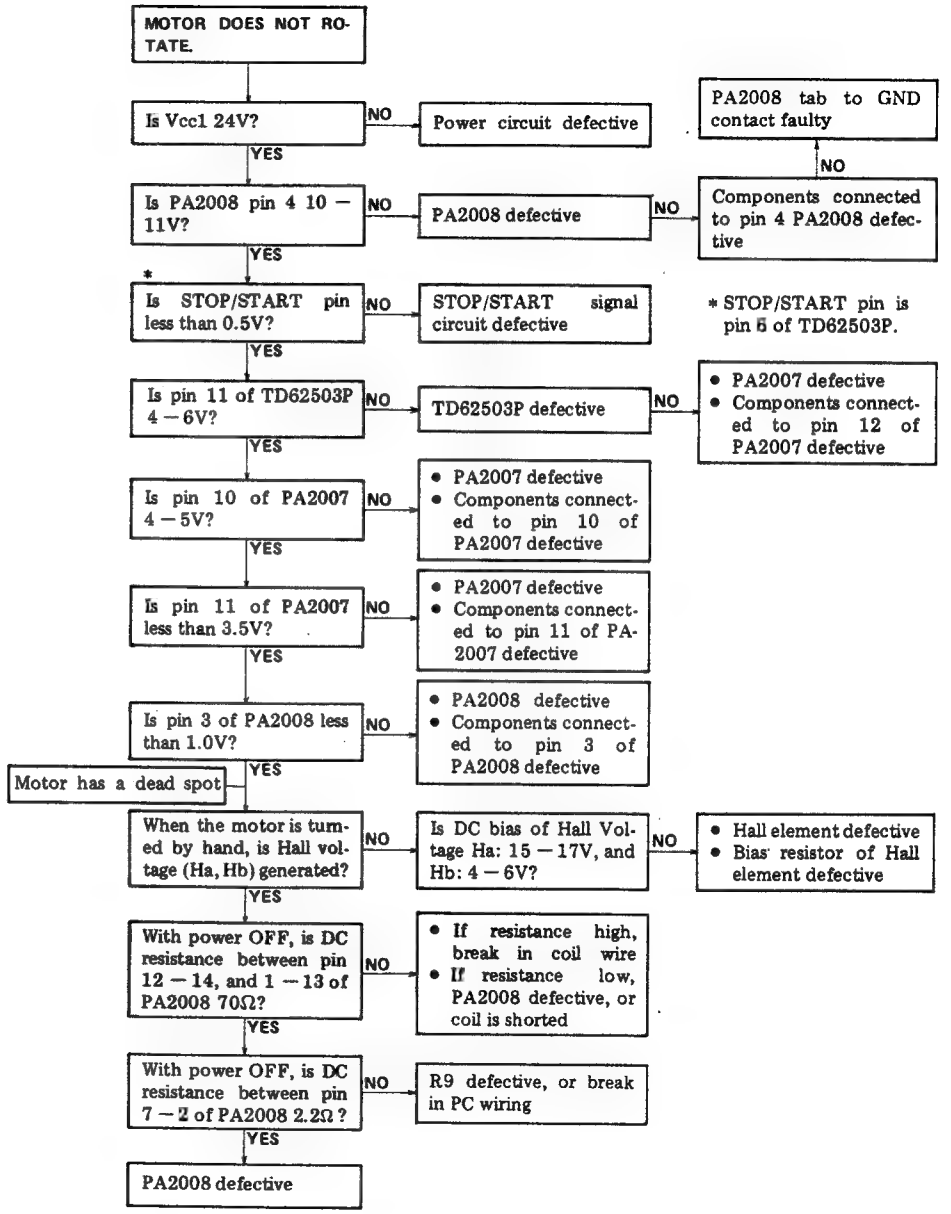
Mark	Part No.	Symbol & Description
	RNH-199	Earth terminal
	SD-5048-07A	Screw
	PSZ30P050FMC	Screw

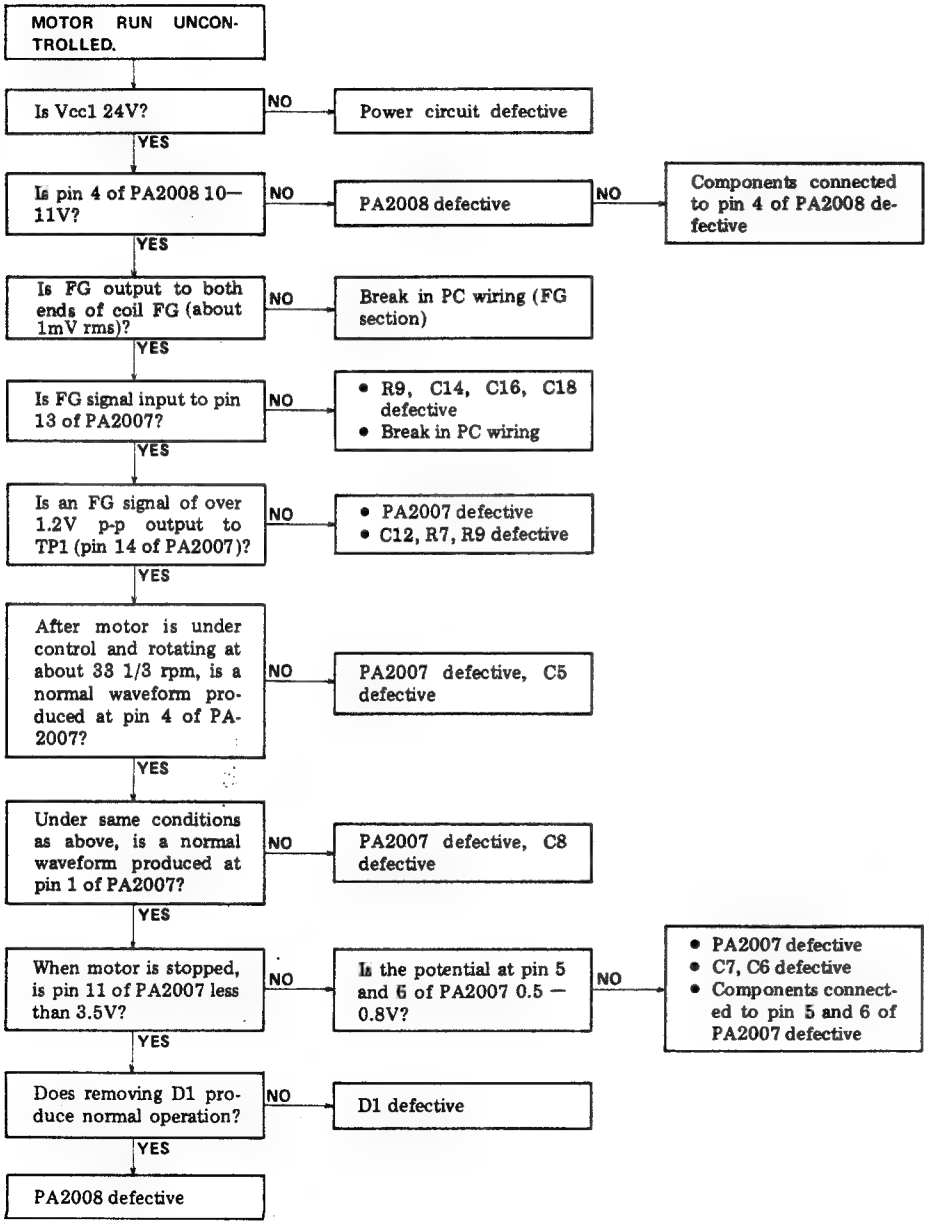
13. TROUBLESHOOTING

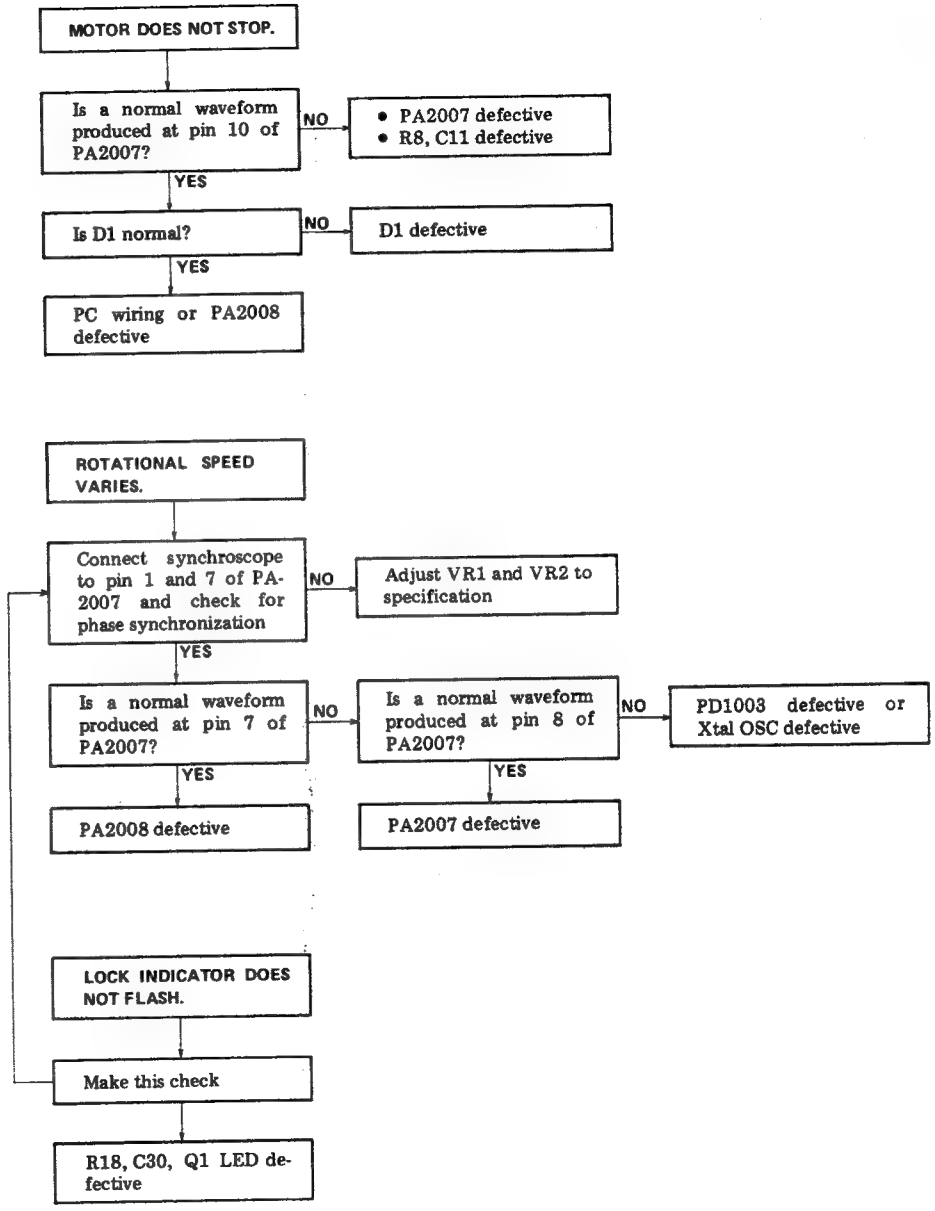





ARM-ELEVATION DOES NOT WORK.
In auto-lead in or auto-return?
YES
Recheck after operation is completed
NO
When tonearm is at rest and EV and power switched ON/OFF, is voltage (approx. 4V) present at both terminals of the driver (F) assembly motor?
YES
• Driver (F) assembly defective
• Belt loose
• Motor defective, wires open
NO
Repeating above steps, does output of IC1 pin 17 and 18 reverse?
YES
Check surrounding PC leads and solder bridges
NO
IC2 defective
Check for PC lead breaks and solder bridges around IC1
SIZE, SPEED, OR REPEAT SWITCHES DO NOT WORK.
Make checks with arm positioned on arm rest
Is input pulse for each switch low when switch is depressed?
NO
Check for solder bridges and PC lead breaks around switch-check
YES
Does the SW display output pin go "H"-"L"?
NO
Check for solder bridges and PC lead breaks around IC1
YES
• LED current limiter resistance wrong value
• LED connection reversed
• LED defective


MOTOR DOES NOT ROTATE.
Is Vcc1 24V?
NO
Power circuit defective
YES
Is PA2008 pin 4 10 — 11V?
NO
PA2008 defective
NO
Components connected to pin 4 PA2008 defective
YES
PA2008 tab to GND contact faulty
NO
*
Is STOP/START pin less than 0.5V?
NO
STOP/START signal circuit defective
YES
* STOP/START pin is pin 5 of TD62503P.
Is pin 11 of TD62503P 4 — 6V?
NO
TD62503P defective
NO
• PA2007 defective
• Components connected to pin 12 of PA2007 defective
YES
Is pin 10 of PA2007 4 — 5V?
NO
• PA2007 defective
• Components connected to pin 10 of PA2007 defective
YES
Is pin 11 of PA2007 less than 3.5V?
NO
• PA2007 defective
• Components connected to pin 11 of PA-2007 defective
YES
Is pin 3 of PA2008 less than 1.0V?
NO
• PA2008 defective
• Components connected to pin 3 of PA2008 defective
YES
Motor has a dead spot
When the motor is turned by hand, is Hall voltage (Ha, Hb) generated?
NO
Is DC bias of Hall Voltage Ha: 15 — 17V, and Hb: 4 — 6V?
NO
• Hall element defective
• Bias resistor of Hall element defective
YES
With power OFF, is DC resistance between pin 12 — 14, and 1 — 13 of PA2008 70Ω?
NO
• If resistance high, break in coil wire
• If resistance low, PA2008 defective, or coil is shorted
YES
With power OFF, is DC resistance between pin 7 — 2 of PA2008 2.2Ω?
NO
R9 defective, or break in PC wiring
YES
PA2008 defective


MOTOR RUN UNCONTROLLED.
Is Vcc1 24V?
NO
Power circuit defective
YES
Is pin 4 of PA2008 10—11V?
NO
PA2008 defective
NO
Components connected to pin 4 of PA2008 defective
YES
Is FG output to both ends of coil FG (about 1mV rms)?
NO
Break in PC wiring (FG section)
YES
Is FG signal input to pin 13 of PA2007?
NO
• R9, C14, C16, C18 defective
• Break in PC wiring
YES
Is an FG signal of over 1.2V p-p output to TP1 (pin 14 of PA2007)?
NO
• PA2007 defective
• C12, R7, R9 defective
YES
After motor is under control and rotating at about 33 1/3 rpm, is a normal waveform produced at pin 4 of PA2007?
NO
PA2007 defective, C5 defective
YES
Under same conditions as above, is a normal waveform produced at pin 1 of PA2007?
NO
PA2007 defective, C8 defective
YES
When motor is stopped, is pin 11 of PA2007 less than 3.5V?
NO
Is the potential at pin 5 and 6 of PA2007 0.5 — 0.8V?
NO
• PA2007 defective
• C7, C6 defective
• Components connected to pin 5 and 6 of PA2007 defective
YES
Does removing D1 produce normal operation?
NO
D1 defective
YES
PA2008 defective


MOTOR DOES NOT STOP.
Is a normal waveform produced at pin 10 of PA2007?
NO
• PA2007 defective
• R8, C11 defective
YES
Is D1 normal?
NO
D1 defective
YES
PC wiring or PA2008 defective
ROTATIONAL SPEED VARIES.
Connect synchroscope to pin 1 and 7 of PA-2007 and check for phase synchronization
NO
Adjust VR1 and VR2 to specification
YES
Is a normal waveform produced at pin 7 of PA2007?
NO
Is a normal waveform produced at pin 8 of PA2007?
NO
PD1003 defective or Xtal OSC defective
YES
PA2008 defective
YES
PA2007 defective
LOCK INDICATOR DOES NOT FLASH.
Make this check
R18, C30, Q1 LED defective

14. ADJUSTMENTS

14.1 STYLUS LOWERING POSITION

1. Remove the rubber plug (Fig. 14-1).
2. If the tonearm lowers too far to the outside of the record, turn the adjusting screw clockwise.
3. If the tonearm lowers too far to the inside of the record, turn the adjusting screw counter-clockwise.

Specifications for test record use.

30cm lowering position... adjust to lower between count 305 and 316.

17cm lowering position... adjust to lower between count 174 and 185.

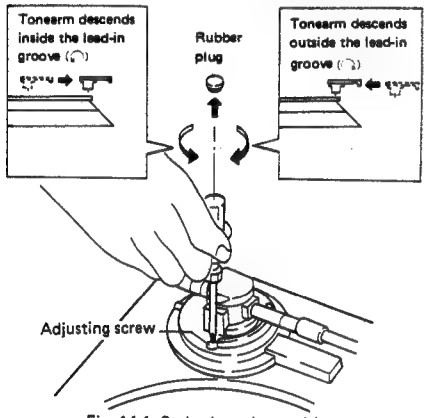


Fig. 14-1 Stylus lowering position

14.2 END SENSOR SENSITIVITY ADJUSTMENT

1. Remove the platter and top cover unit.
2. Make certain the shutter will pass between the sensor board assembly positioned slightly above center (Fig. 14-2).

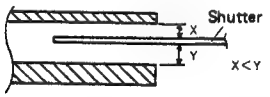
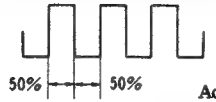


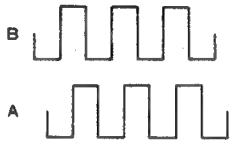
Fig. 14-2 Shutter position

3. Connect an oscilloscope to PD6003 pin 25 (end sensor A) (CN2 3 pin), and PD6003 pin 24 (end sensor B) (CN2 2 pin).
4. Turn the power ON and set the arm-elevation to UP.
   Position the tonearm over the lead out groove zone of the record as if playback were in progress.
5. While making certain outside light is not directly striking the sensor section, adjust VR1 and VR2 so that the output waveform (pulse) for sensors A and B are both at approximately 50% duty cycle (Fig. 14-3, 14-5).



Adjust pulse width of end sensor A and B to 50% duty cycle.

Fig. 14-3 Output waveform 1



The phase of end sensor B leads end sensor A 90°.

Fig. 14-4 Output waveform 2

6. Next, move the tonearm toward the inside of the record at about the speed the tonearm would normally trace the lead out groove.
7. Make certain the phase of end sensor B is 90° advanced over end sensor A (Fig. 14-4).

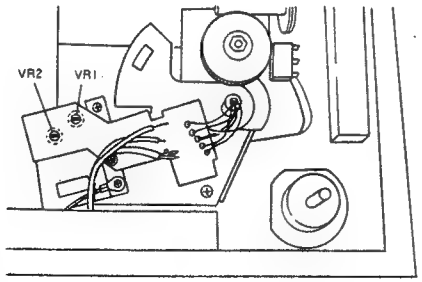


Fig. 14-5 VR1, VR2 position

PL-707

14.3 MOTOR OPERATING POINT ADJUSTMENT

1. Set the speed to 33 1/3 rpm and depress the START/STOP button to put the unit into the operational mode.
2. Connect a buffer amp to pin 1 of IC PA2007, and connect the output to a oscilloscope (Fig. 14-6).
3. When a waveform like that shown in Fig. 14-7 is obtained, vary oscilloscope gain until a sawtooth wave with 5 div peak-to-peak is obtained. Then, referring to Fig. 14-7, adjust VR1 until a to b equals 2.8 to 2.2 (Make sure noise does not affect adjustment.)
4. When the 33 1/3 rpm adjustment is completed, adjust VR2 using the same procedure (item 2 and 3 above) for 45 rpm. Always adjust 33 1/3 first, and always adjust 33 1/3 if 45 rpm is to be adjusted even though it might be accurate.
5. Connect pin 7 of PA2007 to a oscilloscope and make certain the frequency for 33 1/3 rpm is 55.5Hz, and that for 45 rpm is 75Hz.

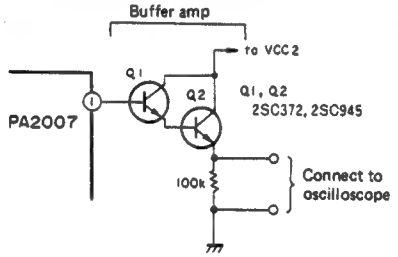


Fig. 14-6 Connect buffer amp

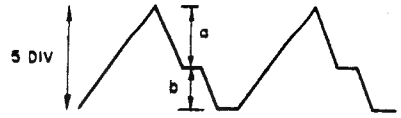


Fig. 14-7 Waveform

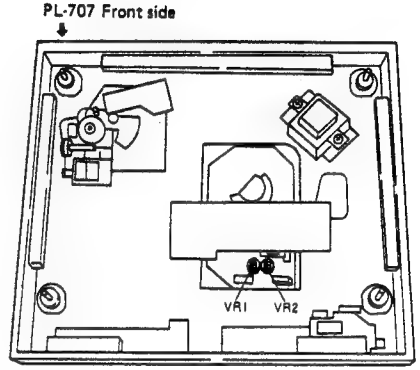


Fig. 14-8 VR1, VR2 position

14. RÉGLAGE

14.1 POSITION DE DESCENTE DE LA POINTE DE LECTURE

1. Retirer l'obturateur en caoutchouc (Fig. 14-1).
2. Si le bras acoustique descend trop loin à l'extérieur du disque, tourner la vis de réglage dans le sens des aiguilles d'une montre.
3. Si le bras acoustique descend trop loin sur le disque, tourner la vis de réglage dans le sens inverse des aiguilles d'une montre.

Caractéristiques de descente sur disque:

Position de descente sur
disque 30 cm .... régler pour une descente entre 305 et 316.

Position de descente sur
disque 17 cm .... régler pour une descente entre 174 et 185.

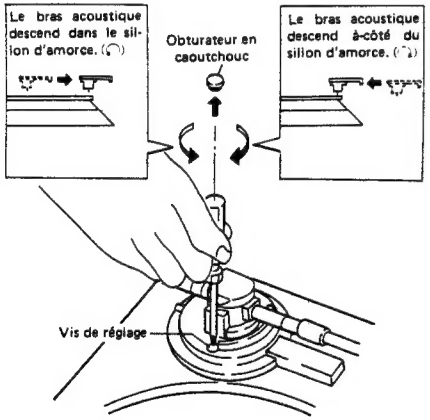


Fig. 14-1 Position de descente de la pointe de lecture

14.2 REGLAGE DE SENSIBILITE DE CAPTEUR DE FIN DE DISQUE

1. Déposer le plateau ainsi que le capot anti-poussière.
2. Veiller à ce que le volet passe entre l'ensemble de plateau de capteur positionné légèrement au-dessus du centre (Fig. 14-2).

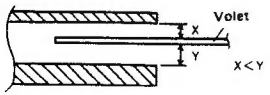


Fig. 12-2 Position du volet

3. Connecter un oscilloscope à la broche 25 de PD6003 (capteur A de fin de disque) (CN2 à 3 broches) et la broche 24 de PD6003 (capteur B de fin de disque) (CN2 à 2 broches).
4. Mettre sous tension et amener le lève-bras sur Up. Positionner le bras acoustique au-dessus du sillon de sortie du disque, comme à la fin de sa reproduction normale.
5. Tout en veillant à ce qu'aucune lumière extérieure n'atteigne le capteur, régler VR1 et VR2 de manière à ce que la forme d'onde de sortie (impulsion) pour les capteurs A et B soit d'environ 50 % du cycle efficace (Fig. 14-3, 14-5).

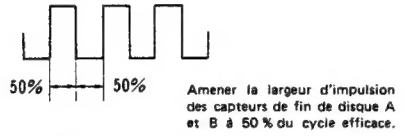


Fig. 14-3 Forme d'onde de sortie 1

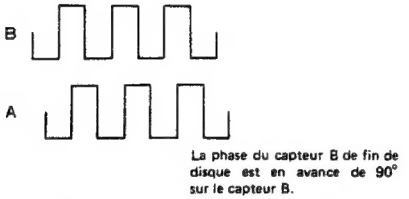


Fig. 14-4 Forme d'onde de sortie 2

6. Amener le bras acoustique vers l'intérieur du disque à environ la vitesse à laquelle il avancerait sur le sillon de sortie.
7. Veiller à ce que la phase du capteur B de fin de disque soit en avance de 90° sur celle du capteur A (Fig. 14-4).

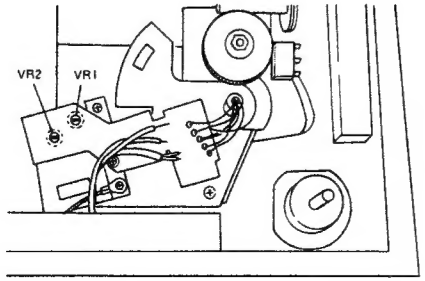


Fig. 14-5 Position de VR1 et VR2

14.3 REGLAGE DE POINT D'ACTIONNEMENT DU MOTEUR

1. Passer sur 33 1/3 tr/mn et appuyer sur la touche START/STOP afin de mettre la table de lecture en marche.
2. Brancher un amplificateur intermédiaire sur la broche 1 du CI PA2007 et connecter la sortie à un oscilloscope (Fig. 14-6).
3. Si la forme d'onde est semblable à celle de la Fig. 14-7, faire varier le gain du oscilloscope jusqu'à ce qu'elle soit en dents de scie avec 5 divisions crête à crête puis, en se reportant à la Fig. 14-7, régler VR1 jusqu'à ce que a à b soit égal à 2.8 à 2.2 (veiller à ce qu'aucun bruit ne gêne le réglage).
4. Lorsque le réglage de 33-1/3 tr/mn est terminé, régler VR2 de la même manière (alinéas 2 et 3 ci-dessus) pour 45 tr/mn. Toujours commencer par régler 33-1/3. Si 45 tr/mn doit être réglée, il convient de commencer par régler 33-1/3 tr/mn, même si cette dernière vitesse est bonne.
5. Connecter la broche 7 de PA2007 à un oscilloscope et vérifier si la fréquence est bien de 55.5Hz pour 33-1/3 tr/mn et de 75Hz pour 45 tr/mn.

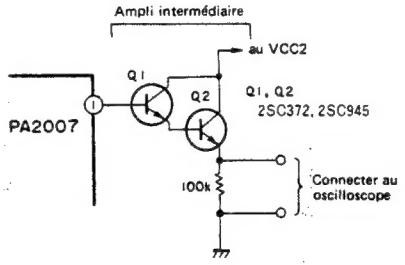


Fig. 14-6 Connexion de l'amplificateur intermédiaire

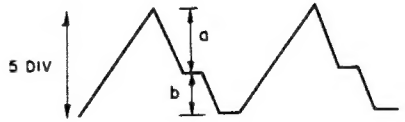


Fig. 14-7 Forme d'onde

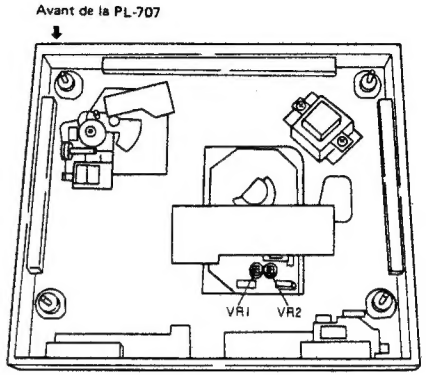


Fig. 14-8 Position de VR1 et VR2

14. AJUSTE

14.1 POSICIÓN DE DESCENSO DE LA AGUJA

1. Sacar el enchufe de goma (Fig. 14-1).
2. Si el brazo fonocaptor desciende muy lejos del tocadiscos, girar el tornillo ajustador hacia la derecha.
3. Si el brazo fonocaptor desciende muy lejos dentro del tocadiscos, girar el tornillo ajustador hacía la izquierda.

Especificaciones para el uso del tocadiscos de prueba:

Posición de descenso
de 30 cm ..... Ajustar para descender entre el valor 305 y 316.

Posición de descenso
de 17 cm ..... Ajustar para descender el valor 174 y 185.

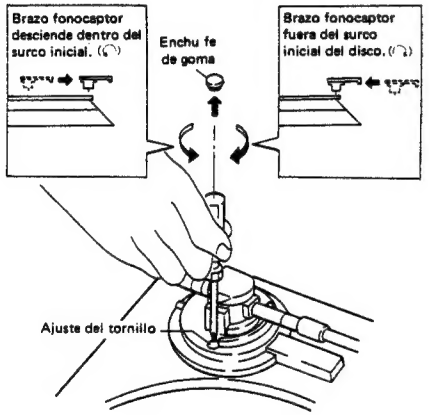


Fig. 14-1 Posición de descenso de la aguja

14.2 AJUSTE DE LA SENSIBILIDAD DEL SENSOR

1. Sacar el plato y la cubierta de la parte superior.
2. Estar seguros que el obturador pasa entre el conjunto de placa del sensor colocada ligeramente encima del centro (Fig. 14-2).

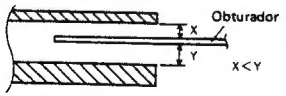
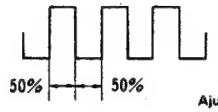


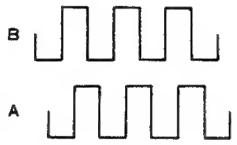
Fig. 14-2 Posición del obturador

3. Conectar un osciloscopio a la pastilla 25 del PD6003 (sensor A) (pastilla 3 CN2) y la pastilla 24 del PD6003 (sensor B) (pastilla 2 CN2).
4. Conectar la alimentación y ajustar la elevación del brazo a UP. Poner el brazo fonocaptor en la parte del surco de la salida del disco como si la reprodución estuviera realizandose.
5. Mientras se está seguro que las luces externas no están dando directamente a la sección del sensor, ajustar VR1 y VR2 de forma que que la forma de ondas de salida para los sensores A y B sean ambas aproximadamente del ciclo de rendimiento del 50 % (Fig. 14-3, 14-5).



Ajustar la anchura del pulso del sensores A y B a un ciclo de rendimiento del 50 %.

Fig. 14-3 Forma de ondas de salida 1



La fase del sensor B está delante 90° del sensor A.

Fig. 14-4 Forma de onda de salida

6. Luego mover el brazo fonocaptor hacia el interior del disco y la velocidad el brazo fonocaptor trazará normalmente el surco de salida.
7. Estar seguros que la fase del sensor B está 90° adelantada sobre el sensor A. (Fig. 14-4)

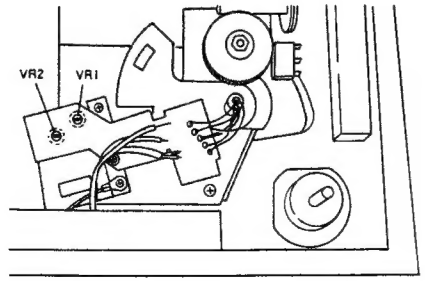


Fig. 14-5 Posiciones de VR1, VR2

14.3 AJUSTAR DEL PUNTO DE FUNCIONAMIENTO DEL MOTOR

1. Ajustar la velocidad a 33-1/3 rpm y presionar el botón START/STOP para poner el aparato en el modo de funcionamiento.
2. Conectar un amplificador intermedio a la pastilla 1 del IG PA2007 y conectar la salida a un osciloscopio (Fig. 14-6).
3. Cuando una forma de onda como la mostrada en la figura 14-7 es obtenida, variar la ganancia del osciloscopio hasta que la onda de dientes de sierra se obtenga 5 divisiones de pico a pico. Luego refiriéndose a la figura 14-7 ajstar VR-1 hasta que a-b iguale 2.8 a 2.2 (estar seguros que el ruido no afecta el ajuste).
4. Cuando el ajuste a 33-1/3 rpm es completo, ajustar VR2 utilizando el mismo procedimiento (puntos 2 y 3 de arriba) para 45 rpm. Siempre ajustar a 33-1/3 primero, y siempre ajustar 33-1/3 si tiene que ajustar 45 rpm. con precisión.
5. Conectar la pastilla 7 del PA2007 al osciloscopio y estar seguro que la frecuencia de 33-1/3 rpm es de 55.5Hz y que para 45 rpm es de 75Hz.

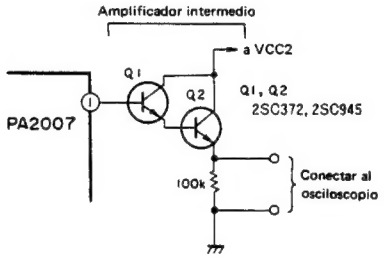


Fig. 14-6 Conectar al amplificador intermedio

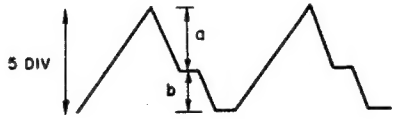


Fig. 14-7 Forma de onda

Lado frontal de PL-707

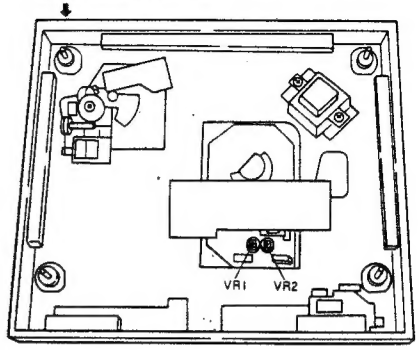


Fig. 14-8 Posiciones de VR1 y VR2

15. FOR HE, HB AND S TYPES

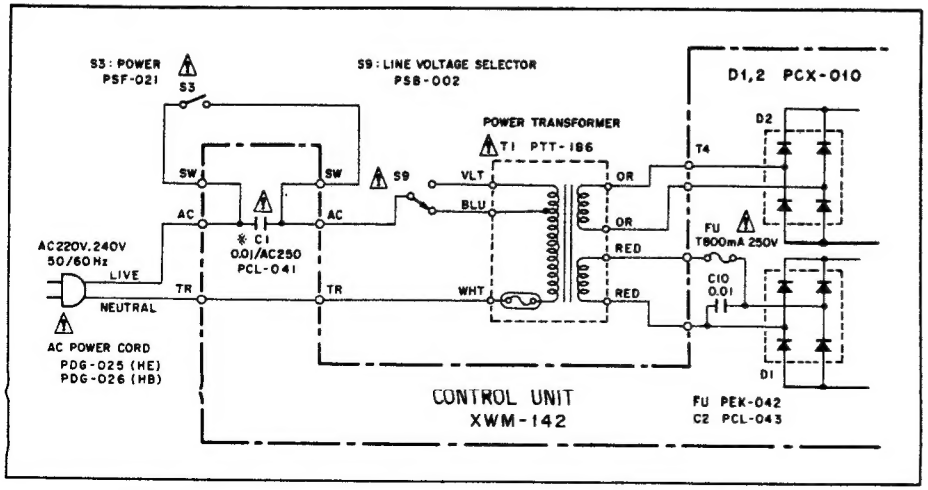
- PL-707/HE, HB and S types are the same as PL-707/KUT type with the exception of the following sections.

15. 1 CONTRAST OF MISCELLANEOUS PARTS

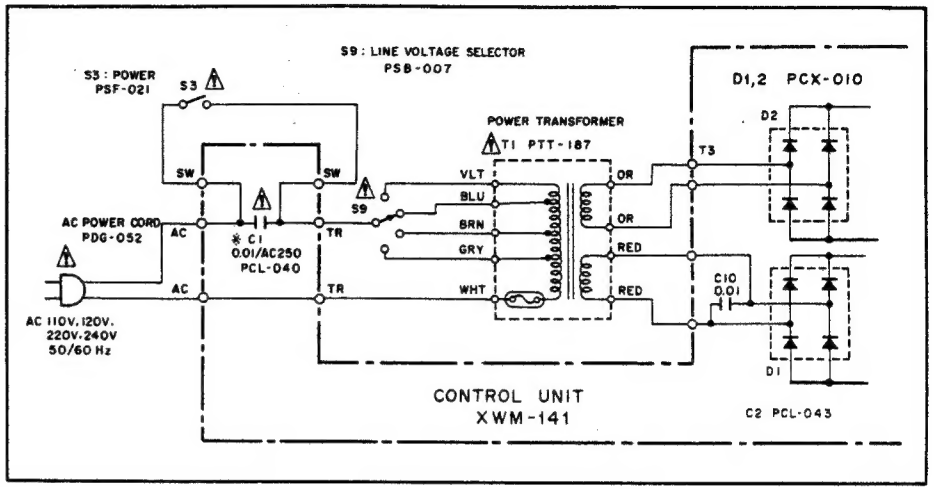
Mark	Symbol & Description	Part No. KUT type	HE type	HB type	S type	Remarks
	Control unit	XWM-141	XWM-142	XWM-142	XWM-141	
⚠ ★	Power transformer (120V)	PTT-185	. . .	. . .	. . .	
⚠ ★	Power transformer (220/240V)	. . .	PTT-186	PTT-186	. . .	
⚠ ★	Power transformer (110/120/220/240V)	. . .	. . .	. . .	PTT-187	
⚠ ★★	Power switch	PSF-022	PSF-021	PSF-021	PSF-021	
⚠	Power cord	PDG-055	PDG-025	PDG-026	PDG-052	
⚠	Fuse T800mA/250V	. . .	PEK-042	PEK-042	. . .	
⚠	Line voltage selector (switchable 2 position)	. . .	PSB-002	PSB-002	. . .	
⚠	Line voltage selector (switchable 4 position)	. . .	. . .	. . .	PSB-007	
	Packing case	PHH-048	PHH-050	PHH-050	PHH-050	
	Operating instructions (English)	PRB-231	. . .	PRB-231	PRB-231	
	Operating instructions (English/German/French/Italian)	. . .	PRE-013	. . .	. . .	
	Cabinet	PMM-197	PMM-198	PMM-198	PMM-198	
	Panel	PNY-049	PNY-100	PNY-100	PNY-100	
	PU cord	PDE-197	PDE-142	PDE-142	PDE-142	
	Strain relief	PEC-087	PEC-088	PEC-088	PEC-087	

15. 2 SCHEMATIC DIAGRAM

- HE, HB types



- S type



PL-707

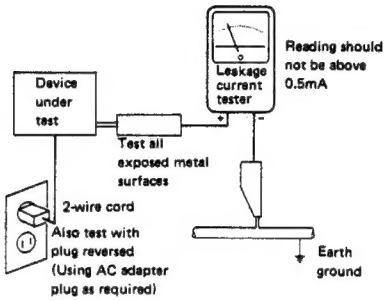
16. SAFETY INFORMATION

1. SAFETY PRECAUTIONS

The following check should be performed for the continued protection of the customer and service technician.

LEAKAGE CURRENT CHECK

Measure leakage current to a known earth ground (water pipe, conduit, etc.) by connecting a leakage current tester such as Simpson Model 229-2 or equivalent between the earth ground and all exposed metal parts of the appliance (input/output terminals, screwheads, metal overlays, control shaft, etc.). Plug the AC line cord of the appliance directly into a 120V AC 60Hz outlet and turn the AC power switch on. Any current measured must not exceed 0.5mA.



AC Leakage Test

ANY MEASUREMENTS NOT WITHIN THE LIMITS OUTLINED ABOVE ARE INDICATIVE OF A POTENTIAL SHOCK HAZARD AND MUST BE CORRECTED BEFORE RETURNING THE APPLIANCE TO THE CUSTOMER.

2. PRODUCT SAFETY NOTICE

Many electrical and mechanical parts in the appliance have special safety related characteristics. These are often not evident from visual inspection nor the protection afforded by them necessarily can be obtained by using replacement components rated for voltage, wattage, etc. Replacement parts which have these special safety characteristics are identified in this Service Manual.

Electrical components having such features are identified by marking with a ⚠ on the schematics and on the parts list in this Service Manual.

The use of a substitute replacement component which dose not have the same safety characteristics as the PIONEER recommended replacement one, shown in the parts list in this Service Manual, may create shock, fire, or other hazards.

Product Safety is continuously under review and new instructions are issued from time to time. For the latest information, always consult the current PIONEER Service Manual. A subscription to, or additional copies of, PIONEER Service Manual may be obtained at a nominal charge from PIONEER.